

SOUTHERN POWER AND INDUSTRY

Ad Index, page 128 SEPTEMBER, 1951

In This Issue

REPORTS FROM SOUTHERN PLANTS

Tennessee—Maintenance 56

Maintenance of 28 buildings covering 15 acres top rated function at Kingsport Press

Louisiana—Diesel Power 62

Three 2,000 hp gas-burning Diesel engines added to Houma municipal power plant

Alabama—Plant Modernization 74

Steam and electric power service brought up to date at Tallassee Mills, Tallassee, Alabama

Alabama—Power Distribution 82

Textile mill power distribution system design and modernization at West Point Mfg. Co.

ENGINEERING REFERENCE DATA

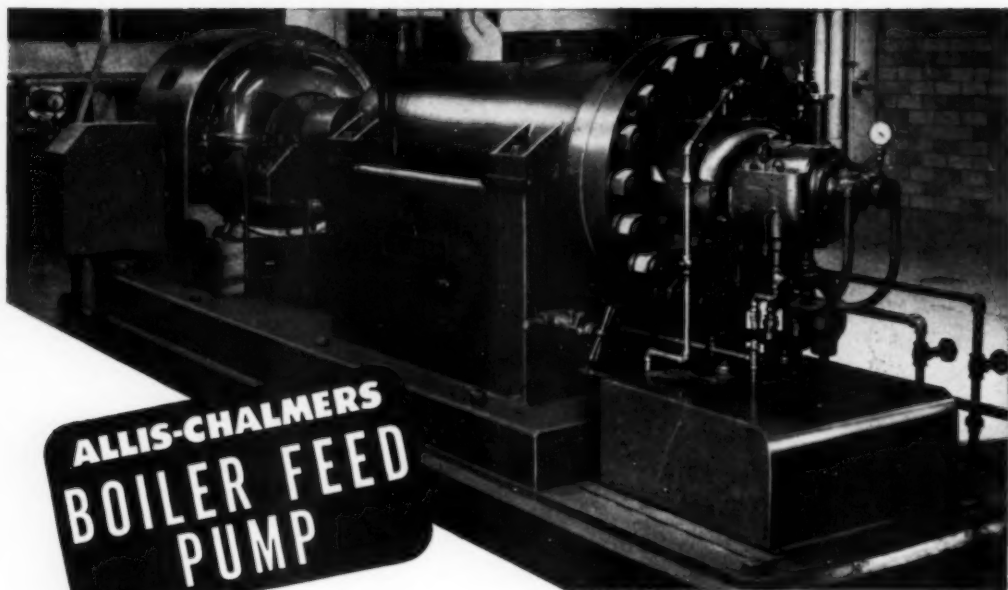
Pressure and Vacuum Gauges 65

Maintaining Processing Equipment 77

Bracing Carload Shipments 88

For Full Table of Contents, See Page 3

Instrumentation
Pressure & Vacuum Gauges
See Page 65



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Executive and Editorial Offices: 808 Peachtree St., N.E., Atlanta 3, Ga. Entered as second-class matter at the Post Office, Philadelphia, Pa.
Subscription Rates: United States and Possessions, \$1.00 per year or three years for \$2.00; Foreign Countries, \$15.00 per year.

Volume 69

Number 9

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SEPTEMBER
1951



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M. M. Lyon
Associate

J. A. Moody
Production Manager

Business Representatives

E. L. Rogers, 299 Madison Ave.,
New York 17, N. Y.—Phone
Murray Hill 2-4959.

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Annual Subscription—\$1.00
Foreign—\$10.00

Published monthly at 54th and
Chertnut, Philadelphia, Pa.
by W. R. C. SMITH PUB. CO.

Publishers also of *Textile Indus-
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Hardware*, *Southern Automotive
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CONTENTS

Maintenance at Kingsport Press, by Guy B. Arthur	56
Celanese in Maryland Adds Compressors	59
Speed Control for Machine Tools, by Francis A. Westbrook	60
Diesel Power at Houma	62
Instrumentation for the Plant Engineer, by E. A. Murphy	65
Special nine page reference report on pressure and vacuum gauges covers types of pressures and vacuums, measuring elements and recommended maintenance procedures.	
Power Modernization at Tallassee Mills, by Guy B. Arthur	74
Maintenance for Processing Plant Equipment, by F. R. Gruner	77
Power Distribution Notations, by R. B. Wickham	82
Steel Strapping Methods for Bracing Carload Shipments	88

PRACTICAL DISCUSSION

Trouble Lamp for M-G Set	94
Planning and Rigging Save Digging	94
Protection against 1500 F	94
Flame-Cutting Slotted Pipe	96
Unique Power Conversion	96

DEPARTMENTS

FACTS AND TRENDS	5	NEW EQUIPMENT	98
BUYERS INFORMATION	16	NEWS OF THE MONTH	115
TIMELY COMMENTS	53	CATALOGS	124
INDUSTRY SPEAKS	55	INDEX TO ADVERTISERS	128

Contents indexed regularly by Engineering Index, Inc.

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

September, 1951

OCTOBER AND MAY Special Issues of SOUTHERN POWER AND INDUSTRY are receiving wide acceptance in the field. And whether or not this item belongs here, the trend has been favorable to these issues for several years and it is now a fact that they are well established as annual features of S.P.I.

The May MAINTENANCE issue is now some months off the press but kind comments continue to feed such ego as a technical editor is permitted.

The October BETTER PRODUCTION issue for '51 is already well past the planning stage and material in hand assures good serviceable information for the readers of this special issue.

NEED FOR TRAINING PROGRAMS is beginning to be recognized by many 10-20 year old companies waking up to the fact that too high proportion of their major executives are in the higher age brackets. Young men must be trained now and taught to carry responsibility if they are to be available to take over as present key employees reach retirement age.

HIGH LABOR COSTS promote the use of more mechanical and automatic equipment; and still there is little surplus manpower. Increased buying power from higher pay, and reduced working hours are keeping pace with automatic machine output. But the whole cycle seems to be moving so dangerously fast that a modest slow-up could create a disproportionately large crash. An economy based on a large proportion of nonessential buying can decelerate much faster than if the buying were largely "bread and meat".

THE GLAMOUR OF ATOMIC ENERGY is stealing the limelight from the more prosaic gas turbine which is also new but less spectacular. Gas turbines, however, are gradually finding their place, particularly in the Southwest where gas and oil are plentiful; while atomic power is still in the possible stage.

Gas turbines need only new materials that are resistant to high temperatures in order to permit still higher economies. Their design problems are well understood and no really new field of science is being explored in their development. But atomic power does take the engineer into a new and unexplored field - a field that presents many hazards and hurdles. That is why atomic power for the masses seems a long way in the future to those most familiar with current tests and experiments.

PANELIZED BRICK WALL construction which permits a 4" wall instead of 8" is one of the new developments expected to rejuvenate the clay industry and keep its products active in competition with newer building materials.

At the brick plant a panel of mortared bricks is made up and reinforcing tie rods are run through the panel to give it sufficient strength so it can be placed in the wall with the same savings associated with other panel construction. With the steel rod reinforcement, such thin walls have shown unusual structural

strength, solving the weight problem which had put masonry at a disadvantage with other building materials.

TEXAS LIGNITE will produce the power for aluminum reduction in Alcoa's new plant scheduled to go into production in 1952 near Waco, Texas. Electricity will be supplied by steam driven equipment using processed lignite as fuel. The power plant will be built and operated for ALCOA by Texas Power and Light Company. Feasibility of Texas lignite as a major fuel resulted only recently from new developments in fuel technology made possible through research sponsored by TP&L, and by the Bureau of Mines experiments in a pilot plant.

SABOTAGE & PLANT PROTECTION is a 25-page booklet of addresses on that subject at a special C of C session. 50¢ - Chamber of Commerce of U. S., Washington, D. C.

FEEDING THE FACTORY WORKER - Forty pages giving findings of a survey of 240 plants and visits to many factories using various methods. Free on request from Paper Cup and Container Institute, 551 Fifth Ave., New York 17, N. Y.

SYNTHETIC "RUBBER" PAINT made with petroleum derivatives is now produced in liquid form. It can be applied like paint to steel, wood, or concrete with a brush or spray gun. An elastic non-cracking neoprene coating, it dries rapidly and is resistant to weather, oil, grease, or chemicals.

FOR BUSINESS MEN who must make trips to Washington because they are unable to work out their defense problems with the Commerce Department field office at home, the new Business Inquiry Center should be the first point of contact in the Nation's Capital.

Located in the main lobby of the Old GAO Building, at Fourth and G Streets Northwest in downtown Washington, the new Center is directly across the street from virtually all NPA and DPA offices. - Phone Sterling 5200.

THE SUPER BAZOOKA, new 3½-inch rocket gun, which has proved so effective against tanks in Korea is constructed largely of aluminum. The barrel is made of the same type of aluminum tubing that goes into portable farm irrigation systems.

THE BEST TIME to eliminate renegotiation headaches is before a defense contract is signed, according to the latest survey of business opinion of over a hundred manufacturing executives, which has just been completed by the National Industrial Conference Board. A careful review of contract provisions and a clarification of allowable costs can help avoid costly and time-consuming negotiations later on.

HEAT ESCAPING from an uninsulated steam line or exhaust flue may or may not have any economic value, but it can start a fire. According to A. S. Hall, Engineering Division, Factory Mutual Laboratories, any surface at a temperature above 700 F will quickly ignite most combustible materials. To avoid this hazard, warns The Magnesia Insulation Manufacturers Association, hot lines and equipment should be insulated regardless of economic considerations.

HOUSTON, TEXAS, has attained Southwest leadership in still another industrial classification - metal manufacturing. Even though the chemical and other industries have made staggering gains, the metal manufacturing group accounts for 28,400—or 36.7 per cent—of the total number employed in non-agricultural industries in metropolitan Houston. This represents the largest single group in the industrial classifications.

Write the editors for additional information on any of the above items.
SOUTHERN POWER & INDUSTRY 806 Peachtree St., N.E. Atlanta 5, Ga.

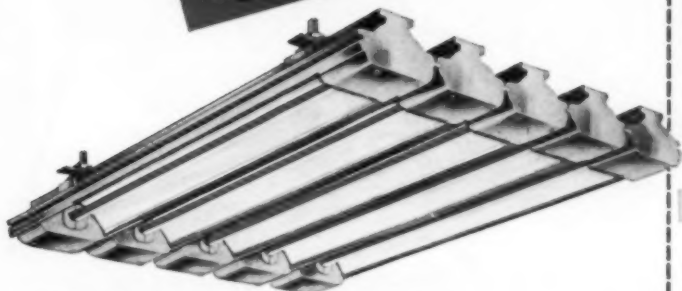
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- ☐ Preheating strips
- ☐ Preheating cloth
- ☐ Curing vinyl
- ☐ Post-forming
- ☐ Curing tubing

METALS

- ☐ Heating molds
- ☐ Degreasing
- ☐ Paint baking
- ☐ Drying piston rings
- ☐ Baking wrinkle paint
- ☐ Welding preheating
- ☐ Drying automotive parts
- ☐ Preheating steel rolls
- ☐ Dehydrating refrigeration coils

GLASS

- ☐ Drying bottles
- ☐ Heating safety glass
- ☐ Setting dye on glass cloth
- ☐ Preheating lenses
- ☐ Drying mirrors

ELECTRICAL

- ☐ Baking armatures
- ☐ Drying marine equipment
- ☐ Sealing headlights and television tubes
- ☐ Drying varnished wire
- ☐ Drying carbon resistors
- ☐ Drying color coding

FOUNDRIES

- ☐ Drying sand cores
- ☐ Skin drying of molds
- ☐ Comfort heating

FOOD

- ☐ Warming
- ☐ Drying baking pans
- ☐ Dehydrating crackers
- ☐ Baking biscuits
- ☐ Dehydrating coconuts

TEXTILES

- ☐ Dehydrating braided material
- ☐ Drying Nylon thread
- ☐ Dehydrating woolen cloth
- ☐ Setting flock

RUBBER

- ☐ Curing
- ☐ Heating rubber glue
- ☐ Curing latex

PRINTING

- ☐ Ink drying
- ☐ Static elimination
- ☐ Glue drying
- ☐ Drying varnished paper
- ☐ Silk screen drying

CERAMICS

- ☐ Drying frit
- ☐ Drying glaze
- ☐ Drying pottery

MISCELLANEOUS

- ☐ Sealing storage batteries
- ☐ Setting adhesives and cements
- ☐ Curing tobacco
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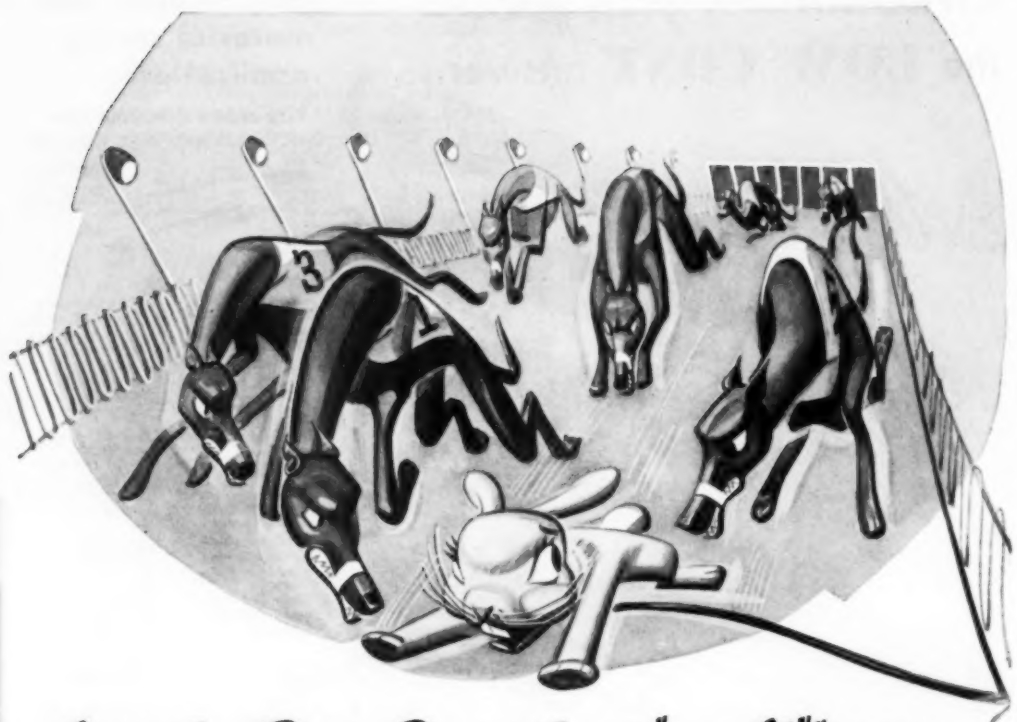
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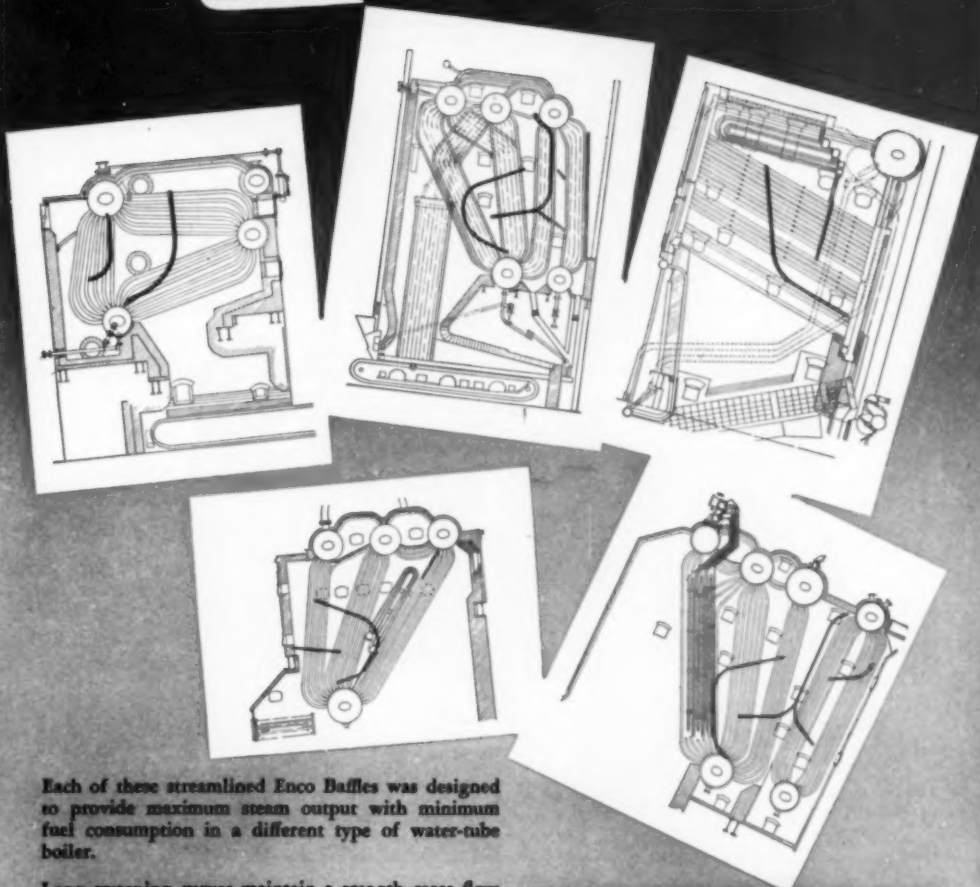
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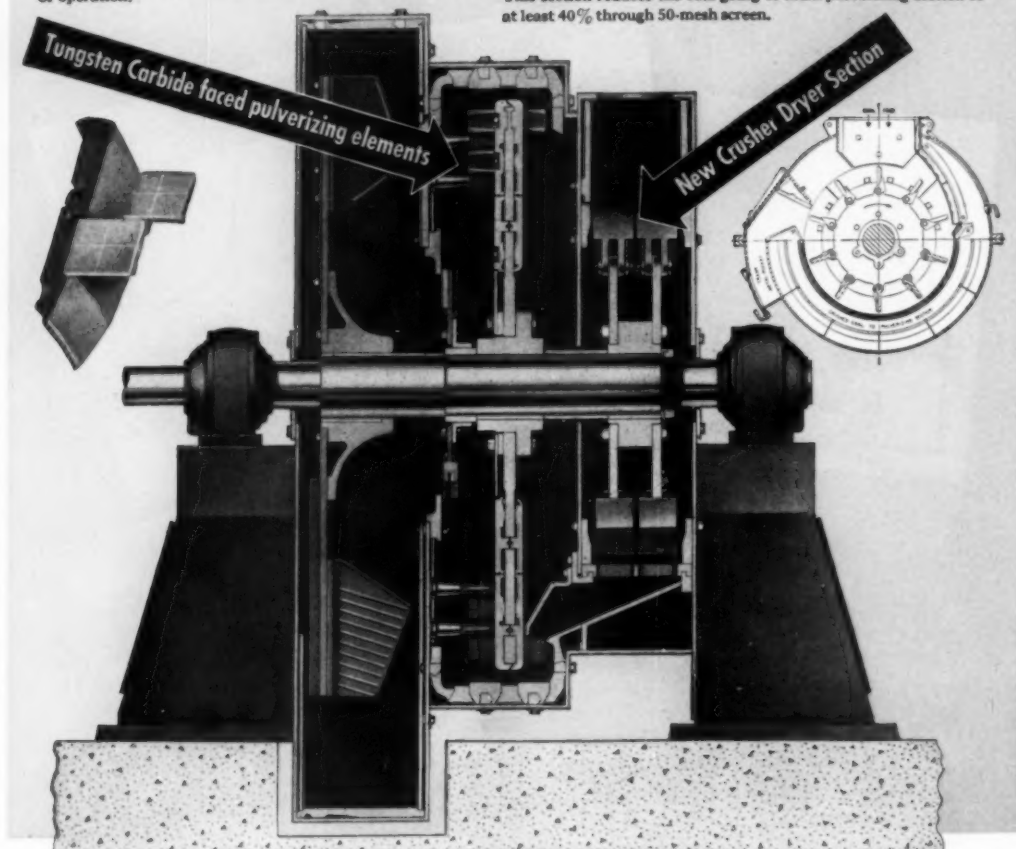
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Gives long uninterrupted operation, low maintenance and sustained fineness over years of operation.

Where the free moisture is evaporated—no capacity reduction with high moisture—where foreign materials in coal are rejected. This section reduces the coal going to main pulverizing section to at least 40% through 50-mesh screen.



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- *8 Ability to carry low loads.
- 9 Flexibility-wide load range.
- *10 Operates without coal, with no noise and without wear or damage to parts.
- 11 Low maintenance and power.
- *12 No explosion hazard, travel of coal through pulverizer faster than flame propagation.
- *13 Quiet vibrationless operation.
- *14 Ease of lighting and regulation.
- 15 High primary air temperatures.
- 16 Thoroughly dependable.
- *17 Negligible cost of lubrication.
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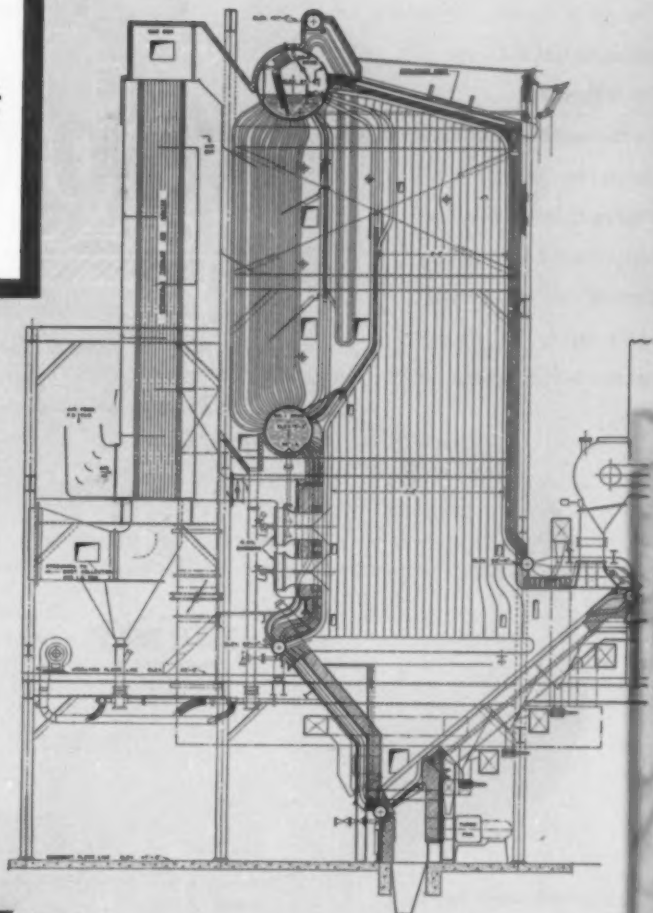
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on Modernization and
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NEW SPRINGFIELD UNIT FOR PULP AND PAPER MILL



*Location: Publisher's Paper Co., Oregon City, Ore.
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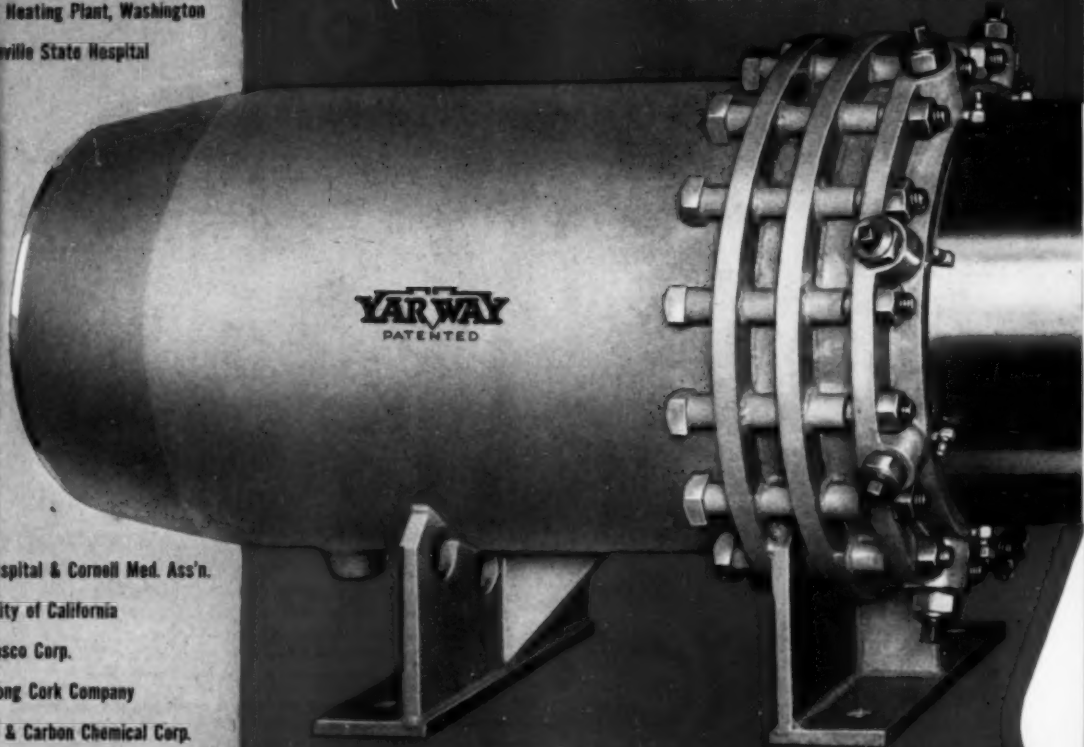
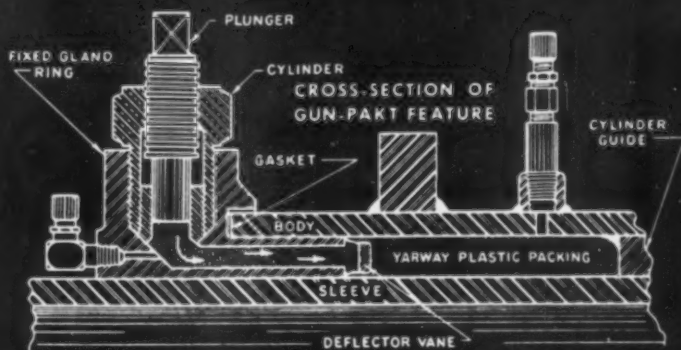
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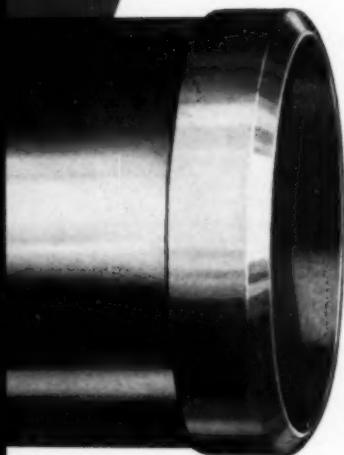
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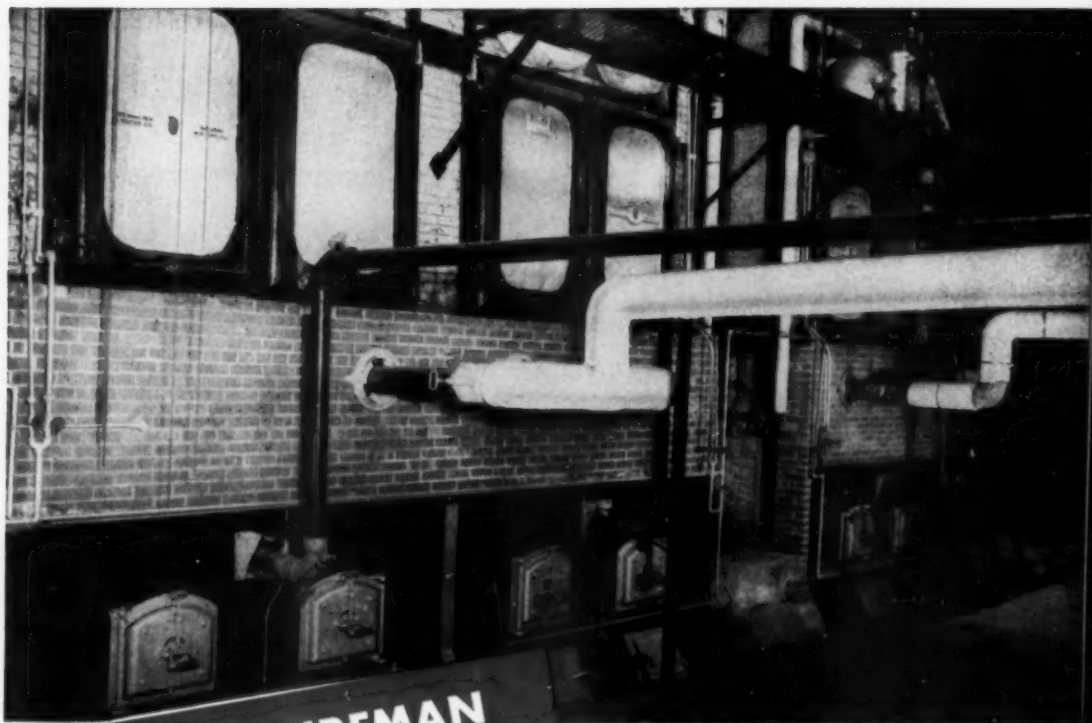
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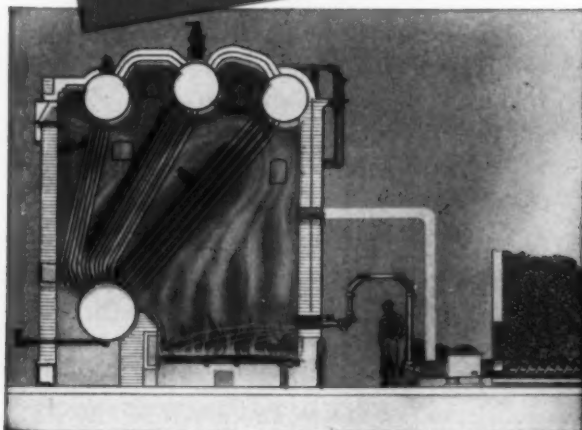
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Fuel feed and air volume rate are automatically synchronized. Air supply is kept in step with coal feed-rate

at all times. The exclusive Iron Fireman infinitely variable transmission, combined with the Iron Fireman Volumeter, assures maximum efficiency at all rates of operation.

You save in other ways, too. The Iron Fireman Pneumatic Spreader stoker is readily adaptable to any boiler room layout—and without costly alterations. Coal bunkers or bins can be located in almost any position relative to the boilers—even on another level above or below the firing floor. Maintenance costs are low. All moving parts are located away from the direct heat of the combustion chamber. Easy to inspect and service. Capacities available to 1,000 boiler horsepower in single units. Multiple units for larger capacities.

Find out today how Iron Fireman firing will cut fuel and labor costs in your boiler room. A survey in your plant, made without cost or obligation to you, will show you. For such a survey, or descriptive literature, write Iron Fireman Mfg. Co., 3139 W. 106th St., Cleveland 11, Ohio, or call your nearest Iron Fireman dealer.

FIREMAN

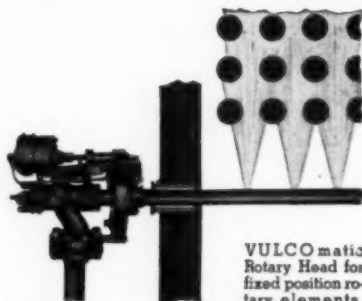
**COAL, GAS, OIL FIRING FOR POWER,
HEATING OR PROCESSING**

TO KEEP YOUR BOILERS CLEAN LOOK TO VULCAN

for **AUTOMATIC SOOT BLOWING**



Vulcan Automatics include simple push button control at the units or automatic sequential operation from a central panel. You'll burn less fuel per pound of steam - - you'll save on maintenance - - for Vulcan units are engineered for steam or air blowing (or both) to keep your boilers clean for operation at top efficiency. Vulcan units are specifically engineered to each job to reach even the least accessible passes.



Operated by push button at unit or from central control panel. Bulletin 486.

Vulcan Gun-Type Blower and Deslagger for automatic push button operation—12 or 24-inch travel as required. Bulletin 471.



Vulcan T-2 Long Retractable Unit (shown partially extended) travels up to 25 feet. Revolving lance cleans effectively on forward and retracting cycles. Bulletin 474.



for **MANUAL SOOT BLOWING**



Left, Vulcan Gun-Type Blower and Deslagger for manual operation. Bulletin 471.


Right, Vulcan Rotary Head for fixed position rotary elements. Bulletin 485.



VULCAN SOOT BLOWER DIVISION
Continental Foundry & Machine Company
DUBOIS, PENNSYLVANIA

VULCAN *Automatic Soot* **BLOWERS**

Yours for the asking—



Taylor Forge SEAMLESS WELDING FITTINGS
Short End Weld-UP Long End Weld-UP

Welding Fittings: 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 24"

Materials: A53, A105, A234, A312, A334, A354, A368, A387, A501, A503, A504, A507, A509, A510, A511, A512, A513, A514, A515, A516, A517, A518, A519, A520, A521, A522, A523, A524, A525, A526, A527, A528, A529, A530, A531, A532, A533, A534, A535, A536, A537, A538, A539, A540, A541, A542, A543, A544, A545, A546, A547, A548, A549, A550, A551, A552, A553, A554, A555, A556, A557, A558, A559, A560, A561, A562, A563, A564, A565, A566, A567, A568, A569, A570, A571, A572, A573, A574, A575, A576, A577, A578, A579, A580, A581, A582, A583, A584, A585, A586, A587, A588, A589, A590, A591, A592, A593, A594, A595, A596, A597, A598, A599, A600, A601, A602, A603, A604, A605, A606, A607, A608, A609, A610, A611, A612, A613, A614, A615, A616, A617, A618, A619, A620, A621, A622, A623, A624, A625, A626, A627, A628, A629, A630, A631, A632, A633, A634, A635, A636, A637, A638, A639, A640, A641, A642, A643, A644, A645, A646, A647, A648, A649, A650, A651, A652, A653, A654, A655, A656, A657, A658, A659, A660, A661, A662, A663, A664, A665, A666, A667, A668, A669, A670, A671, A672, A673, A674, A675, A676, A677, A678, A679, A680, A681, A682, A683, A684, A685, A686, A687, A688, A689, A690, A691, A692, A693, A694, A695, A696, A697, A698, A699, A700, A701, A702, A703, A704, A705, A706, A707, A708, A709, A710, A711, A712, A713, A714, A715, A716, A717, A718, A719, A720, A721, A722, A723, A724, A725, A726, A727, A728, A729, A730, A731, A732, A733, A734, A735, A736, A737, A738, A739, A740, A741, A742, A743, A744, A745, A746, A747, A748, A749, A750, A751, A752, A753, A754, A755, A756, A757, A758, A759, A760, A761, A762, A763, A764, A765, A766, A767, A768, A769, A770, A771, A772, A773, A774, A775, A776, A777, A778, A779, A780, A781, A782, A783, A784, A785, A786, A787, A788, A789, A790, A791, A792, A793, A794, A795, A796, A797, A798, A799, A800, A801, A802, A803, A804, A805, A806, A807, A808, A809, A810, A811, A812, A813, A814, A815, A816, A817, A818, A819, A820, A821, A822, A823, A824, A825, A826, A827, A828, A829, A830, A831, A832, A833, A834, A835, A836, A837, A838, A839, A840, A841, A842, A843, A844, A845, A846, A847, A848, A849, A850, A851, A852, A853, A854, A855, A856, A857, A858, A859, A860, A861, A862, A863, A864, A865, A866, A867, A868, A869, A870, A871, A872, A873, A874, A875, A876, A877, A878, A879, A880, A881, A882, A883, A884, A885, A886, A887, A888, A889, A890, A891, A892, A893, A894, A895, A896, A897, A898, A899, A900, A901, A902, A903, A904, A905, A906, A907, A908, A909, A910, A911, A912, A913, A914, A915, A916, A917, A918, A919, A920, A921, A922, A923, A924, A925, A926, A927, A928, A929, A930, A931, A932, A933, A934, A935, A936, A937, A938, A939, A940, A941, A942, A943, A944, A945, A946, A947, A948, A949, A950, A951, A952, A953, A954, A955, A956, A957, A958, A959, A960, A961, A962, A963, A964, A965, A966, A967, A968, A969, A970, A971, A972, A973, A974, A975, A976, A977, A978, A979, A980, A981, A982, A983, A984, A985, A986, A987, A988, A989, A990, A991, A992, A993, A994, A995, A996, A997, A998, A999, A1000

ON THIS SIDE - Data on the WeldELL line

Taylor Forge ASA FORGED STEEL FLANGES

Flanges: 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 24"

Materials: A53, A105, A234, A312, A334, A354, A368, A387, A501, A503, A504, A507, A509, A510, A511, A512, A513, A514, A515, A516, A517, A518, A519, A520, A521, A522, A523, A524, A525, A526, A527, A528, A529, A530, A531, A532, A533, A534, A535, A536, A537, A538, A539, A540, A541, A542, A543, A544, A545, A546, A547, A548, A549, A550, A551, A552, A553, A554, A555, A556, A557, A558, A559, A560, A561, A562, A563, A564, A565, A566, A567, A568, A569, A570, A571, A572, A573, A574, A575, A576, A577, A578, A579, A580, A581, A582, A583, A584, A585, A586, A587, A588, A589, A590, A591, A592, A593, A594, A595, A596, A597, A598, A599, A600, A601, A602, A603, A604, A605, A606, A607, A608, A609, A610, A611, A612, A613, A614, A615, A616, A617, A618, A619, A620, A621, A622, A623, A624, A625, A626, A627, A628, A629, A630, A631, A632, A633, A634, A635, A636, A637, A638, A639, A640, A641, A642, A643, A644, A645, A646, A647, A648, A649, A650, A651, A652, A653, A654, A655, A656, A657, A658, A659, A660, A661, A662, A663, A664, A665, A666, A667, A668, A669, A670, A671, A672, A673, A674, A675, A676, A677, A678, A679, A680, A681, A682, A683, A684, A685, A686, A687, A688, A689, A690, A691, A692, A693, A694, A695, A696, A697, A698, A699, A700, A701, A702, A703, A704, A705, A706, A707, A708, A709, A710, A711, A712, A713, A714, A715, A716, A717, A718, A719, A720, A721, A722, A723, A724, A725, A726, A727, A728, A729, A730, A731, A732, A733, A734, A735, A736, A737, A738, A739, A740, A741, A742, A743, A744, A745, A746, A747, A748, A749, A750, A751, A752, A753, A754, A755, A756, A757, A758, A759, A760, A761, A762, A763, A764, A765, A766, A767, A768, A769, A770, A771, A772, A773, A774, A775, A776, A777, A778, A779, A780, A781, A782, A783, A784, A785, A786, A787, A788, A789, A790, A791, A792, A793, A794, A795, A796, A797, A798, A799, A800, A801, A802, A803, A804, A805, A806, A807, A808, A809, A810, A811, A812, A813, A814, A815, A816, A817, A818, A819, A820, A821, A822, A823, A824, A825, A826, A827, A828, A829, A830, A831, A832, A833, A834, A835, A836, A837, A838, A839, A840, A841, A842, A843, A844, A845, A846, A847, A848, A849, A850, A851, A852, A853, A854, A855, A856, A857, A858, A859, A860, A861, A862, A863, A864, A865, A866, A867, A868, A869, A870, A871, A872, A873, A874, A875, A876, A877, A878, A879, A880, A881, A882, A883, A884, A885, A886, A887, A888, A889, A890, A891, A892, A893, A894, A895, A896, A897, A898, A899, A900, A901, A902, A903, A904, A905, A906, A907, A908, A909, A910, A911, A912, A913, A914, A915, A916, A917, A918, A919, A920, A921, A922, A923, A924, A925, A926, A927, A928, A929, A930, A931, A932, A933, A934, A935, A936, A937, A938, A939, A940, A941, A942, A943, A944, A945, A946, A947, A948, A949, A950, A951, A952, A953, A954, A955, A956, A957, A958, A959, A960, A961, A962, A963, A964, A965, A966, A967, A968, A969, A970, A971, A972, A973, A974, A975, A976, A977, A978, A979, A980, A981, A982, A983, A984, A985, A986, A987, A988, A989, A990, A991, A992, A993, A994, A995, A996, A997, A998, A999, A1000

ON THIS SIDE

- Data on Taylor Forged Steel Flanges

A VOLUME OF DATA

... covering welding fittings and forged steel flanges ...

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, 1/2" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, 1/2"

through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or

MAIL THE COUPON.

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Offices in all principal cities.

Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

NAME _____

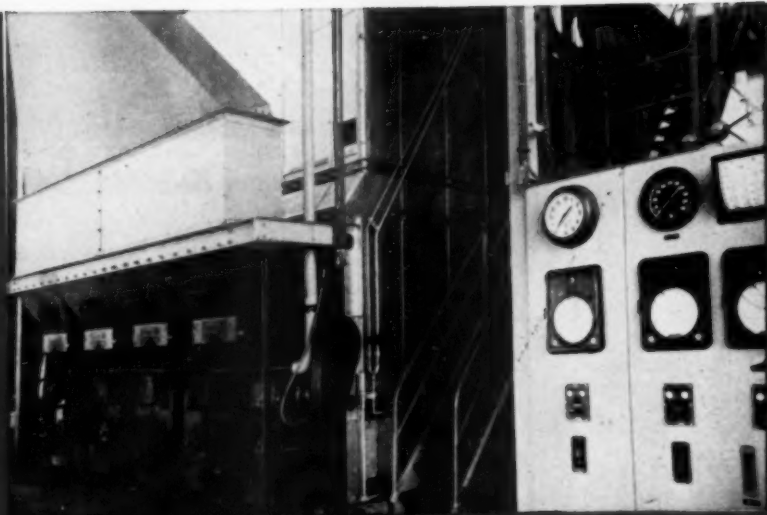
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*Detroit Rotastoker of the positive operated dumping grate type—see below—30,000 lbs. capacity.
 21 boiler—Capacity 70,000 pounds.*

DETROIT ROTOSTOKER

Handles widely and rapidly fluctuating load with uniform pressure

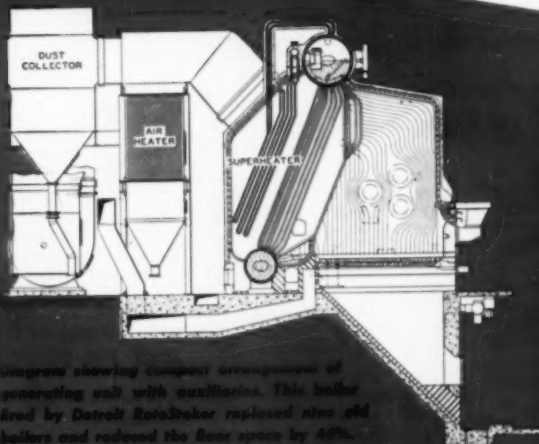
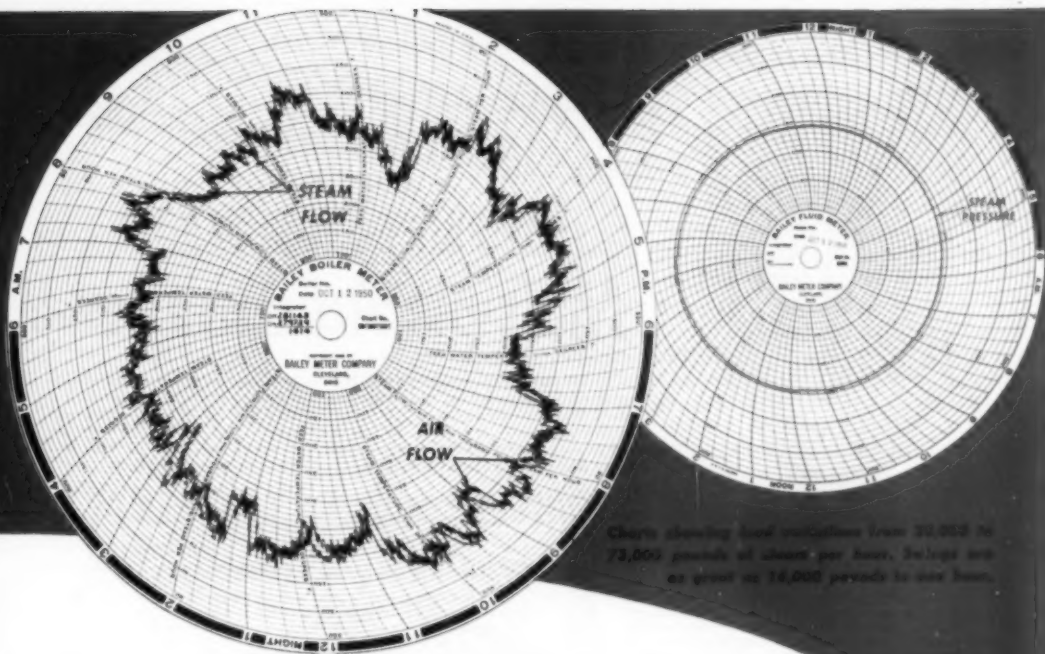


Diagram showing compact arrangement of generating unit with auxiliaries. This boiler fired by Detroit Rotastoker replaced nine old boilers and reduced the floor space by 45%.

Furnace interior showing dumping grates of the Detroit Rotastoker and emergency burners in side-wall for oil or gas.





Charts showing load variations from 20,000 to 72,000 pounds of steam per hour. Savings are as great as 14,000 pounds to one hour.

at Kerr Bleaching & Finishing Works, Inc. CONCORD, N. C.

**Detroit RotoStoker with Babcock & Wilcox boiler affects
40% Fuel Saving . . . 50% Labor Saving . . . 46% Less Floor Space**

Fuel, labor, and floor space savings were outstanding in this new Bleaching and Finishing Company boiler plant. A single boiler of 70,000 pounds of steam per hour maximum capacity replaced nine old boilers. The Detroit RotoStoker supplied the modern firing method which moved both fuel and labor.

As is common with heavy users of process steam, demands vary widely and rapidly. Often the variation in one hour will amount to as much

as 16,000 pounds. Steam pressure remains steady.

The Detroit RotoStoker is a modern spreader stoker. It efficiently burns any type of bituminous coal. By means of automatic regulation of fuel feed and air supply, fluctuating loads are easily handled.

Write for catalog on Detroit RotoStokers. They are available in many sizes to fit the furnace and load—with stationary, hand dumping or power dumping grates.

**DETROIT
STOKERS**

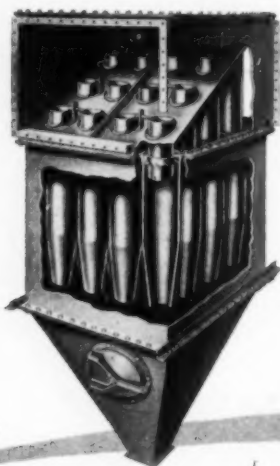
*Other Types and Sizes of Detroit Stokers
for Every Industrial or Power Need*

DETROIT STOKER COMPANY

General Motors Building—Detroit 2, Michigan

District Offices in Principal Cities • Works at Warren, Michigan

Before you buy *any* equipment for recovering dust or fly ash...



COMPARE ALL OTHERS against MULTICLONE'S Multiple Advantages

Because the advantages of MULTICLONE are so clear-cut, so vitally important, so far-reaching in the savings they make, we urge you to make a factual unbiased comparison of MULTICLONE dust and fly ash collection equipment against *any other* in the mechanical recovery field. Only by making such a comparison can you fully appreciate the major savings and greater performance you get by installing MULTICLONE Collectors!

COMPARE Recovery Efficiency!

It is a recognized fact that the separating efficiency of a cyclonic tube increases as the tube diameter decreases because smaller tubes generate greater centrifugal forces. The patented vane in the MULTICLONE makes the use of small tubes practical without complicated manifolding and permits compacting many small tubes into one simple, highly efficient unit. MULTICLONE's higher centrifugal forces throw out not only the large, medium and small particles, but also an unusually high percentage of the extremely small particles of 10 microns and less. Result—more complete recovery of all suspended particles from the gas stream!



COMPARE Space-Saving Compactness!

Plant space costs money—particularly at today's high construction costs. Because the MULTICLONE is more compact, size for size, it makes *really important* savings in space and plant costs. Note in the chart how the MULTICLONE requires substantially less space—both in floor space and cubic space—than any other unit of comparable capacity and performance. This means vital savings in construction costs!

Make	Relative Space Requirements	
	In Sq. Ft.	In Cu. Ft.
Multiclone	1.8	1.8
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

COMPARE Dollar-Saving Adaptability!

Savings in space is just one of many ways MULTICLONE reduces installation costs. Because the shape of the unit can be readily varied (long and narrow, short and wide, or square) to fit available spaces, the MULTICLONE can often be tucked into odd corners and waste areas too restricted for other equipment.

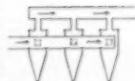
Moreover, inlet-outlet ducts can be varied—side-inlet side-outlet, or side-inlet top-outlet—to meet low headroom or restricted side clearance requirements... and the single-inlet single-outlet duct design permits greater flexibility and simpler installation. These all add up to vital savings in installation costs!



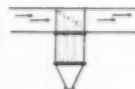
Side inlet, Side inlet,
Side outlet Top outlet

COMPARE All-Around Simplicity!

The MULTICLONE is simple and inexpensive to maintain because there are no highspeed moving parts to repair or replace... no pads or filters to clean or renew... nothing to choke the gas flow or increase draft losses as suspended materials are recovered. In addition, the square, flat-sided shape of the MULTICLONE and its straight inlet and outlet ducts are far simpler to install and insulate. And since the recovered material from an entire bank of tubes is collected in a single hopper, it is much easier to service and maintain than the multiple hoppers of conventional cyclone units. Here again, the MULTICLONE saves in many ways—all of them important!



Conventional Cyclone



Multiclone

Whether your recovery installation is in a new structure or for modernizing present equipment, you will be far ahead by installing MULTICLONE Collectors. Our experienced engineers will gladly make helpful suggestions for simplifying your recovery problems. A letter, wire or call to our nearest office places this assistance at your service without obligation.



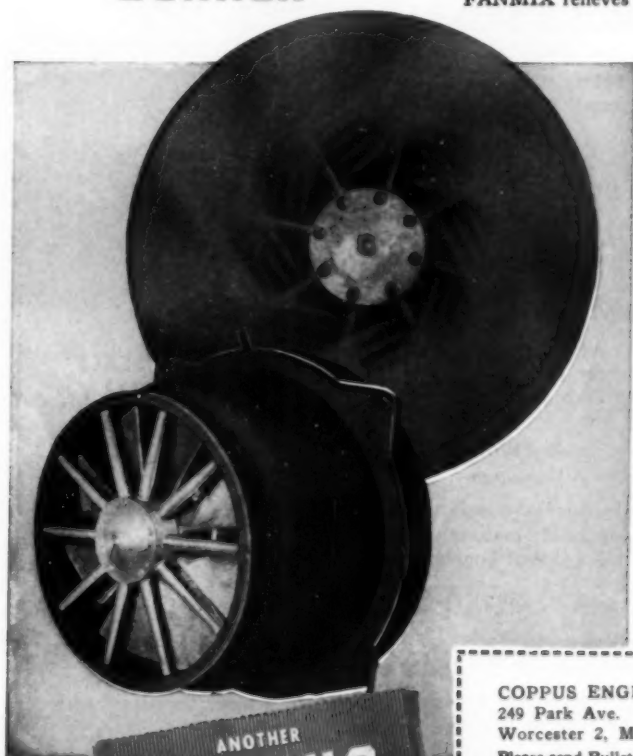
Send for Helpful Literature! This factual MULTICLONE literature explains the basic principles of cyclonic dust recovery and gives technical data helpful to anyone contemplating a dust or fly ash recovery installation. Write today for your free copy!

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CAPACITY
with a
FANMIX
BURNER**



ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

Increase Boiler Ratings On Present Or Planned Equipment

In all types of Coppus-Dennis FANMIX Burners — straight gas or combination gas-oil — we utilize the energy of the fuel under pressure to drive the burner fan and deliver air in the proper proportion to the fuel flow. This exclusive "pinwheel action" *mechanically* mixes fuel and air in exactly the right proportions for truly radiant, non-luminous heat.

The result is uniform temperature everywhere in the combustion chamber — no drifting "hot spots" — and complete combustion under all conditions. That's why you can release more heat into your present furnace — why in new installations you get more heat into smaller furnace space.

FANMIX Saves On Both Old and New Installations

FANMIX can easily be operated with your present furnace and stack, requiring only minor changes in other equipment. Or if you're planning on new boilers, remember that FANMIX relieves the furnace from the burden of mixing, creates its own forced draft and takes smaller pipe sizes. Which means you can plan on reduced combustion space, less stack, no forced draft equipment and lower installation costs all around.

Get the Whole Story

Coppus engineers FANMIX Burners to meet individual requirements, providing complete control over heat pattern and combustion . . . Learn more about how "pinwheel action" can step up your boiler performance to peak efficiency and economy — as it is doing throughout industry. Send for Bulletin 410-6. Coppus Engineering Corp., Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, and MINING CATALOGS.

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Garlock
"Chevron" Seal



Wherever leakless operation is required—specify **GARLOCK Mechanical Seals**

When leakless operation of centrifugal or rotary pumps is required—particularly, if corrosive or inflammable liquids are being handled—GARLOCK Mechanical Seals will do the job.

These seals are composed of two main elements; one rotates with the shaft and the other is stationary. Since the stationary element does not contact the shaft, there is *no* wear on the shaft. A positive contact between carefully lapped metal-to-carbon or, metal-to-metal mating surfaces provides the leakless seal.

Users of GARLOCK Mechanical Seals have reported outstanding service records on a wide variety of applications. Here are just two taken from the many in our files:

- ▶ Over 3 years' service and still in operation, on a $1\frac{3}{4}$ " shaft of a boiler feed pump handling water at 220°F. and 200 p.s.i., and operating at 3600 r.p.m.
- ▶ Two years' service, and still in operation, on a 1" shaft of a pump handling paint at 130°F., 10' Hd., operating at 1750 r.p.m.

GARLOCK manufactures mechanical seals in many standard and special designs from a wide range of high quality materials. For more information, write for our Mechanical Seal booklet or call your GARLOCK representative.



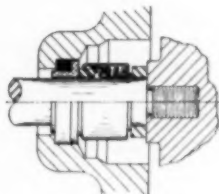
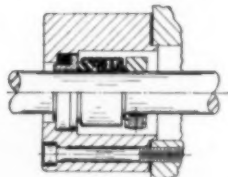
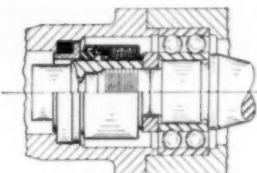
THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

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of Canada Ltd., Toronto, Ont.

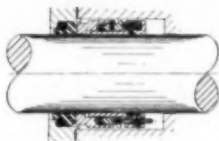
GARLOCK

TYPICAL APPLICATIONS of GARLOCK Mechanical Seals for Rotary Shafts

PACKAGE SEALS



CHEVRON-TYPE SEALS

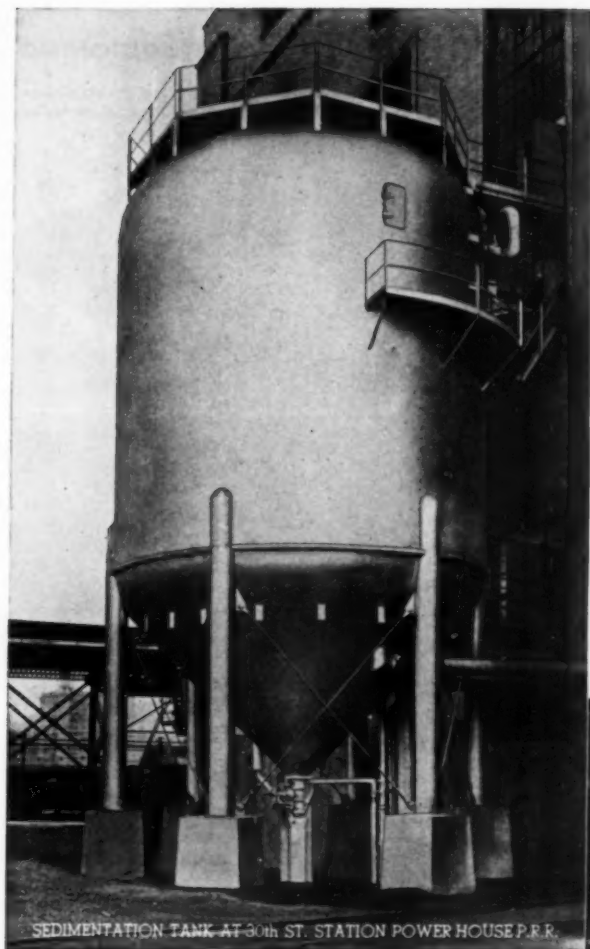


Type CB—Balanced "Chevron" Seal

"O" RING SEALS



Type OB—Balanced "O" Ring Seal



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Hot Process SOFTENER

Serves a Great Railroad



ONE of the features of the huge Pennsylvania Station—30th Street, Philadelphia, of the Pennsylvania Railroad is the ultra modern power plant designed by internationally recognized architects and engineers. Recently installed in this power plant to serve additional capacity is a Cochrane two-stage Hot Process Softener for the boiler feed. It will handle 80,000 gallons per hour makeup and 10,000 gallons per hour condensate. The first stage of softening is lime and soda ash, the second stage is phosphate treatment. The water is then filtered.

Cochrane developed the hot process of softening boiler feed many years ago and has continued its leadership in the water treatment field.

Consult Cochrane on any problem involving water conditioning.



FILTERS IN 30th ST. STATION POWER HOUSE P.R.

COCHRANE

PIONEERS AND LEADERS IN BOILER FEED, PROCESS & INDUSTRIAL WATER CONDITIONING





*** 2,800,000 C.F.M. ... 120 AIR CONDITIONING**

SYSTEMS... showing 5 of the 324 Clarage Fans delivering conditioned air to manufacturing areas.



*** Upjohn**

installs

CLARAGE HEAVY-DUTY FAN EQUIPMENT

Fine Pharmaceuticals!...the making of over 700 different kinds has started in this great plant of the Upjohn Company, 10 minutes south of Kalamazoo.

Here much of the manufacturing...**to maintain integrity of product**...is dependent upon air conditioning. 120 complete systems handling 2,800,000 c.f.m. are installed.

Upjohn has had more than a quarter-century of experience with Clarage Equipment. It well may be that this was the deciding factor in selecting Clarage **HEAVY-DUTY** Fans for **every one** of the air conditioning systems operating in this new Upjohn plant.

A multimillion dollar project...
Engineers and Builders, The
Austin Company, Cleveland.

CLARAGE FAN COMPANY

KALAMAZOO, MICHIGAN

APPLICATION ENGINEERING OFFICES... IN ALL PRINCIPAL CITIES

CLARAGE

**—HEADQUARTERS for Air Handling
and Conditioning Equipment**



One VU can start a family

With fuel costing what it does today, it is more important than ever before to select a boiler that will assure the most efficient performance possible. That is why so many companies who watch steam costs closely have acquired sizeable families of Vertical Unit Boilers. For example:

A Chemical Company ordered two VU Boilers in 1939. In 1946 five more were ordered for three of their other plants. In 1949 another was ordered for one of these same plants, and in 1950 two more units for a fifth plant. In 1951 three more units were ordered for still another plant — thirteen units for six plants in twelve years!

An Electric Utility Company ordered its first VU in 1941. In 1945 it ordered a second VU for a different plant. For another of its plants one unit was installed in 1946 and two more in 1947. In 1949 a VU was installed in a fourth plant, and in 1950 one was installed in a fifth plant. A total of seven boilers in five different plants.


A Sugar Company ordered two VU Boilers for one of its plants before the war. In 1946 it ordered a VU for a second plant. And in 1950 another VU was installed in this same plant.

A Steel Company now has a total of fourteen VU Boilers in four different plants. Starting with an installation of two units in the early thirties, it has reordered six times. The most recent installation of two units at one of its plants was completed in 1948.

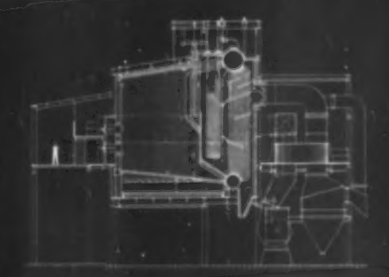
* * *

This is just a small sample of the hundreds of companies that have ordered and reordered the VU Unit. They have found *through their own experience* that the advanced design, sound construction and consistent reliability of the VU Unit mean *lower steam costs*. Once you have a VU in service you soon know why it is that so often one VU starts a family.

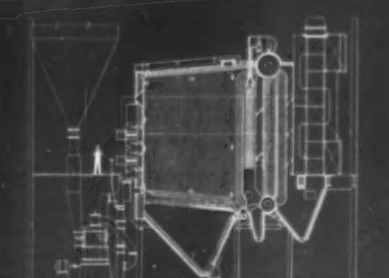
B-494A



VU-10 Boiler fired with oil or gas. VU-10 Boilers range in capacity from 10,000 to 60,000 lb of steam per hour. They may also be fired by spreader, underfeed or chain grate stokers.



VU-50 Boiler fired with oil. Capacity of the unit shown is 235,000 lb of steam per hour; operating pressure—920 psi; steam temperature—905 F. Unit arranged for future pulverized coal firing if desired.



VU-50 Boiler fired with pulverized coal. Capacity of unit shown is 150,000 lb of steam per hour; operating pressure—625 psi; steam temperature—760 F. C-E Tubular Air Heater follows the boiler.



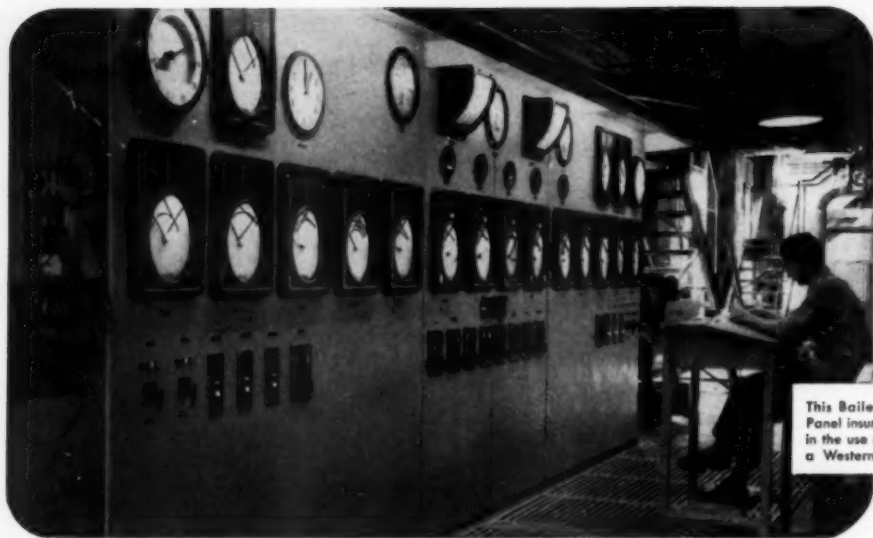
COMBUSTION ENGINEERING — SUPERHEATER, INC.

Combustion Engineering Building

200 Madison Avenue • New York 16, N. Y.

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

SOUTHERN POWER & INDUSTRY for SEPTEMBER, 1951



This Bailey Boiler Control Panel insures high efficiency in the use of Fuel-Dollars at a Western Chemical Plant.

What's Your Fuel-dollar Efficiency?

A dollar's worth of fuel has the *same potential* energy, no matter who's boiler it fires. But how much of the energy actually gets converted to a usable form depends on how you operate your boiler.

That's where Bailey Controls can help. And, here's why, we believe, you'll get better fuel-dollar efficiency with Bailey:

- 1. Complete Range of Equipment—fully co-ordinated.** You need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment, just because he has a limited line to sell—or that Bailey will pass the buck for efficient control; we offer *complete* boiler control systems.
- 2. Engineering Service—backed by experience.** No other manufacturer of instruments and controls can offer as broad an experience, based on successful installations involving all types of combustion, flow measurement and automatic control.
- 3. Direct Sales-Service—conveniently located near you.** Bailey Meter Company's Sales-Service Engineers are located in more

industrial centers than those of any other manufacturer of boiler control systems; you get prompt, experienced service with a minimum of travel time and expense.

For better fuel-dollar efficiency—for more power per fuel-dollar, less outage and safer working conditions, you owe it to yourself to investigate Bailey Controls. Ask a Bailey Engineer to arrange a visit to a nearby Bailey installation. We're proud to stand on our record: "More power to you!"

A-109-1



BAILEY METER COMPANY

1028 IVANHOE ROAD
CLEVELAND 10, OHIO

Controls for Steam Plants

COMBUSTION • FEED WATER
TEMPERATURE • PRESSURE
LIQUID LEVEL • FEED PUMPS



88% SAVINGS THROUGH NEW CABLE DESIGN

How Okonite-engineered cables save money for the McCall Corporation

Engineers of the McCall Corporation, Dayton, Ohio, sought a means of reducing their insulated cable replacements on six printing presses. The ordinary cables used for supplying the gas ignition apparatus failed quickly because of temperatures ranging from 350 to 450°F. Monthly replacements of the standard rubber-insulated automotive ignition cable previously used gave rise to the following costs:

BEFORE

Cost of cable per year \$650.00
Labor in replacement 900.00
Yearly cost: materials and labor \$1550.00

In 1948, at the suggestion of an Okonite engineer, McCall installed Okonite's heat-resistant Okotherm cable. Since then, no replacements have been made under conditions of normal usage. Although the Okotherm cable was sev-

eral times as expensive, experience has already shown that annual costs have been reduced to a mere fraction of the previous cost, as follows:

NOW

Cost of cable per year \$142.00
Labor on installation 37.50
Total yearly cost using Okotherm \$179.50
...a saving of 88.5%



Stories like this are not unusual in the file of actual case histories at Okonite. For the broad research and design and manufacturing skills which have developed such long-lived, trouble-free cables for normal use, have also developed many types for highly specialized applications.

These facilities are available to *you*, to help solve any difficult cable problems arising in *your* operation. Don't hesitate to call in your nearest Okonite representative, or write The Okonite Company, Passaic, N. J.



OKONITE



THE BEST CABLE IS YOUR BEST POLICY

insulated wires and cables

**pipng upkeep
costs more
now!**

**You spend less for it
by using Dependable Quality**

CRANE VALVES

*... That's why
more Crane Valves
are used
than any other make*

**NO BONNET JOINT LEAKAGE . . .
NO BONNET JOINT MAINTENANCE**

Big maintenance savings can be made on high-pressure/high-temperature piping services by using Crane Pressure-Seal Bonnet valves in place of bolted bonnet valves. Once installed, these valves rarely need maintenance of the bonnet joint—line pressure keeps it leak-tight.

Lighter weight and more compact dimensions make savings in piping erection and suspension. Streamlined body design reduces insulating costs.

Other outstanding and typical features of Crane Pressure-Seal Bonnet Joint design are tailored-to-the-service alloy steels, Stellite trim, deep stuffing box, and flexible wedge disc in larger gates. In gates, globes, angles, or stop-checks, these valves are an investment in better piping performance at lower ultimate cost.

*Pressure-Seal Bonnet Gate—available
in 600, 900, and 1500 pound classes*

CRANE

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CRANE CO., General Offices:

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Branches and Wholesalers Serving All Industrial Areas

SOUTHERN POWER & INDUSTRY for SEPTEMBER, 1951

40% Saved on new wiring

At Stewart-Warner Electric's radio and television plant in Chicago, 4/0 Aluminum RH insulated conductor supplies 440-volt AC power for a new assembly line. Savings due to using Aluminum amounted to over 40% because of the cable's low initial cost and the easier, faster installation of the lighter-in-weight metal.

Electricians Howard Norton (left) and Al Iverson soldering aluminum connections at distribution panel. Below: Howard Norton, looking over completed job at panel said, "Aluminum is very satisfactory to install because of its lightness and workability..."



figure your new wiring job in Aluminum and figure low

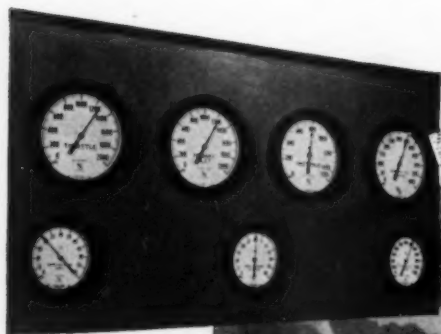
Get prices both ways—in Alcoa Aluminum and in copper. See for yourself the worth-while savings possible when you plan wiring for production lines, new power feeders or improved wiring for higher capacities.

Although the rearmament program restricts the use of Aluminum we are ready to help you with the planning for trouble-free, low-cost wiring. For information write ALUMINUM COMPANY OF AMERICA, 1773J Gulf Bldg., Pittsburgh 19, Penna.



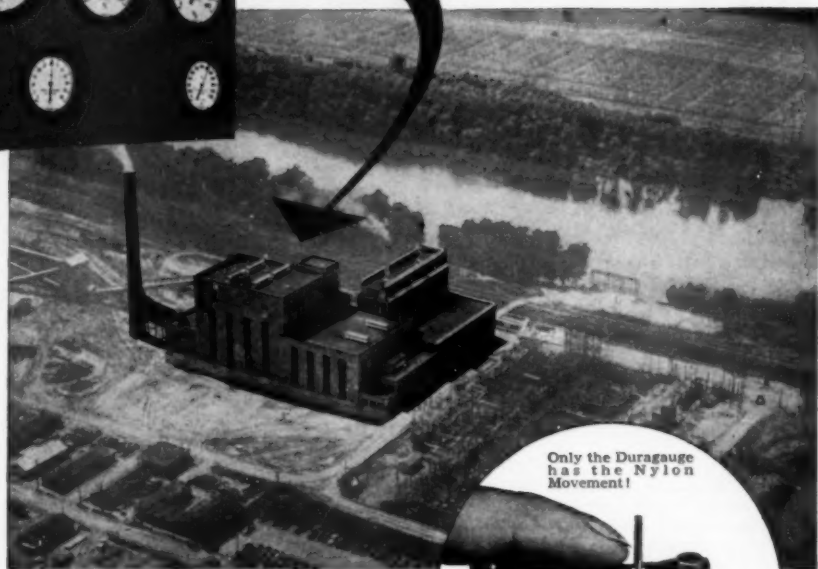
of ALCOA  ALUMINUM are made by leading manufacturers

Aluminum Conductors

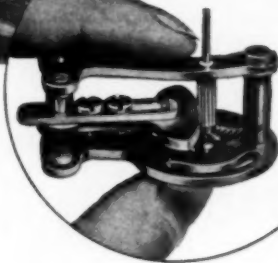


DURAGAUGE INSTALLED

Ashcroft Duragauges are now serving in the 60,000 KW addition to the Bremo Power Station of the Virginia Electric and Power Company. Addition designed and constructed by Stone & Webster Engineering Corporation.



Only the Duragauge has the Nylon Movement!



✓ Sustained Accuracy

✓ Improved Sensitivity

✓ Longer Service Life

THE ASHCROFT

Duragauge
ASSURES ALL THREE!

Eliminate excessive weight and mass of parts in designing a pressure gauge and you achieve new standards of accuracy, sensitivity and service life.

Ashcroft engineers attained these objectives in the Duragauge Nylon Movement*. Bearings and pinion gear are light, strong, dimensionally stable nylon. Friction and wear are minimized. Resistance to corrosion is increased. Shock impact absorption is improved. Advantages to you: sustained accuracy, greater

sensitivity, low maintenance and longer service life. The Ashcroft Duragauge, with Nylon Movement, outwears all others.

Since its introduction in 1947, the Nylon Movement has been widely recognized for unmatched performance in "killing" services in power stations, refineries and chemical plants. Ask your Ashcroft Distributor for all the facts. He will gladly help you select the right Duragauge for your specific needs.

* Patented



ASHCROFT GAUGES

A product of MANNING, MAXWELL & MOORE, INC. STRATFORD, CONNECTICUT

MAKERS OF 'ASHCROFT' GAUGES, 'HANCOCK' VALVES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

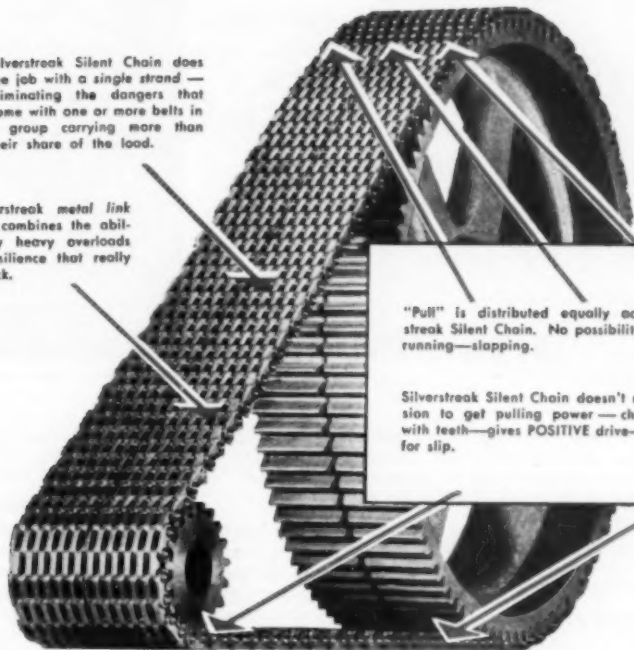
SLIP- PROOF SLAP- PROOF SHOCK- PROOF

Silverstreak Silent Chain does the job with a single strand — eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.

Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.

"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.

Silverstreak Silent Chain doesn't rely on tension to get pulling power — chain meshes with teeth—gives POSITIVE drive—no chance for slip.



12,259-C

Get Full RPM Transmission With LINK-BELT Silverstreak Silent Chain Drives

Yes, get the amazing, trouble-free efficiency of 98.2%. A standard of operation that continues throughout the long, long life of the drive. More than this — every rating and design is backed by a record of *proven performance*. And every chain is engineered for the job. You conserve space, too —

for Link-Belt Silverstreak Silent Chain Drives operate efficiently on short centers. Ratios as high as 10 to 1 are commonly used.

Little wonder, then, that so many concerns to whom top operation efficiency and rugged dependability are a must, standardize with Link-Belt Silverstreak Silent Chain Drives.

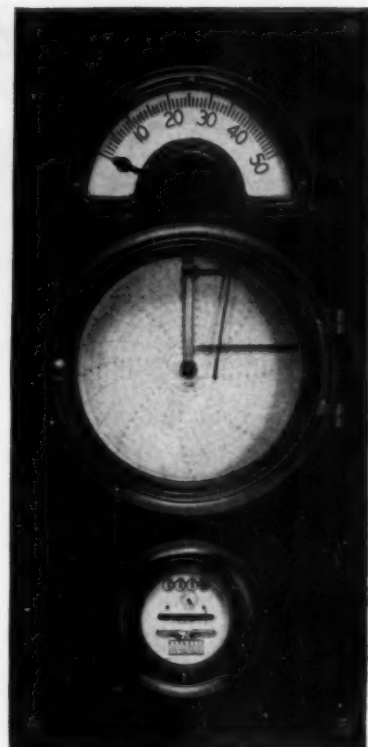
LINK-BELT COMPANY, Atlanta, Dallas 1, New Orleans 12, St. Louis 1, Charlotte 2, N. C., Baltimore 18, Birmingham 3, Houston 1, Jacksonville 2.
Distributors Throughout the South

LINK-BELT
SILVERSTREAK SILENT CHAIN DRIVES



Integrator

Varying flows are accurately totalized because the integrator is continuous



Indicator-Recorder-Integrator

The Republic flow integrator, being of the modified watt-hour type, totalizes continuously—not intermittently. It operates independently of the recorder and its accuracy is not dependent on or affected by any clock mechanism or mechanical action.

The Republic meter is, on this account, peculiarly fitted to follow all changes in flow rate and accurately measure highly fluctuating flows.

ALL TYPES OF FLUIDS

Republic electric type flow meters are available for measuring the flow of all types of liquids and gases. Meter bodies are built for metering fluids at line pressures up to 5,000 lb. per sq. in. and for all ranges of differential pressure. The reading instruments—indicator, recorder and integrator—are of the remote reading type and can be located any distance from the point of flow measurement.

ANY COMBINATION

While each Republic reading instrument is standard in design and construction each is especially calibrated for the particular flow measurement for which it is specified. Any reading instrument, indicator, recorder

or integrator, may be obtained separately or in any combination desired, making possible the highest degree of flexibility in plant use.

SIMPLE IN OPERATION

The Republic electric meter is the only flow meter commercially manufactured which is strictly electric in its operation. All other types of so called electric meters use the motion of the mercury to move a float or produce a force which is then converted into an electrical value which is in turn transmitted to a receiving or reading instrument. In the Republic meter, the transmitted electrical value is determined directly by the mercury motion, thus eliminating one of the steps in the sequence, and simplifying the mechanism to that extent. There are no floats, levers, cams, rotating shafts or anything else to interfere with the unimpeded movement of the mercury, which has no work to perform, but merely fulfills the function of making contact.

NEW DATA BOOK

Just off the press—a completely new data book describing and illustrating, in detail, the operating features of the Republic Flow Meter and its many applications. Write for your copy of Data Book No. 702—there is no obligation.

REPUBLIC FLOW METERS CO.

• 2240 DIVERSEY PARKWAY • CHICAGO 47, ILLINOIS

now you can
reduce
steam costs
with the
automatic

Powermaster®



Model 3 Powermaster—15 to 500 H.P.; high or low pressure models for steam or hot water.

Exclusive burner design (patent applied for) is yours with the *Powermaster* steam generator. Compare this unit with others and you'll see why users are saving hundreds of dollars on fuel bills. Only the *Powermaster* gives you these 3 definite ways to reduce your costs for steam or hot water—

1. *Use less fuel* when boiler operates between 100% and 30% of capacity. Special burner gives you full modulation in a wide range between high and low fire.
2. *Save clean-up time* and money because complete combustion of fuel gives practically smokeless and carbon-free operation. Case histories show that the *Powermaster* needs cleaning less often than other self-contained units.
3. *Change from oil to gas* (or gas to oil) in just a few minutes. Take advantage of low fuel rates, enjoy freedom from worry about fuel shortages.

Write for this catalog

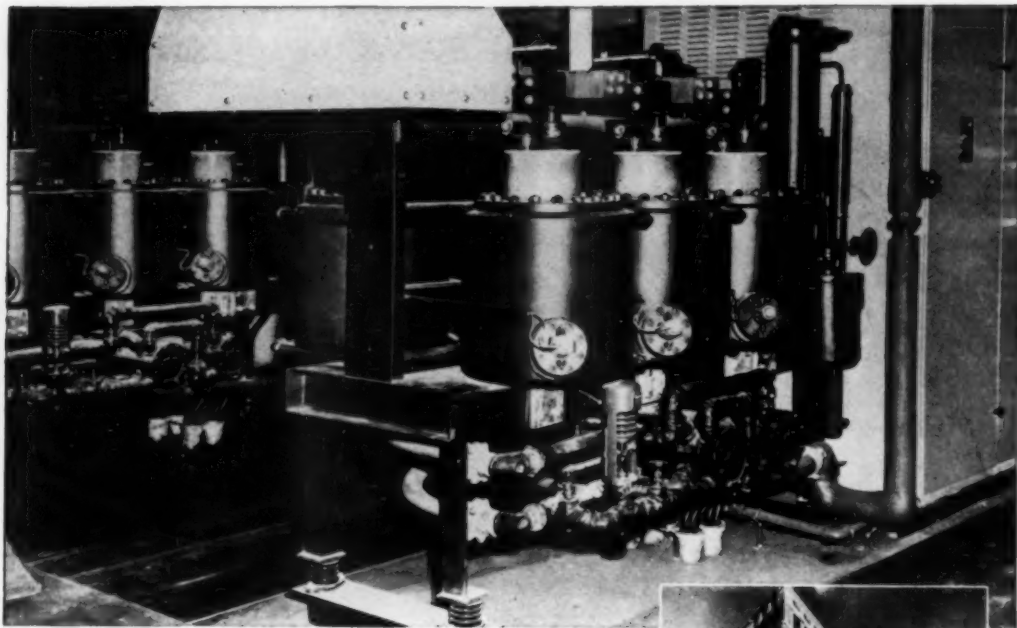
that gives you the entire story of the *Powermaster* steam generator. Just ask for Catalog 1218 and we'll put one in the mail for you.



ORR & SEMBOWER, INC., Established 1885
910 Morgantown Road, Reading, Pennsylvania

only the
Powermaster®
gives you
all 3
advantages

World's Largest Store uses 5000-kw Rectifier Installation



Macy's replaces d-c generating plant with G-E IGNITRON RECTIFIERS

When this famous New York store decided to discard its d-c generating plant and buy power, it had a problem. A considerable portion of its equipment required d-c power but only a-c power could be bought. After considering various methods of power conversion, Macy's chose dependable, proved-in-service G-E Ignitron Rectifiers to supply the 5000 kw of d-c capacity it needed.

The G-E Ignitron Rectifiers operate 24 hours a day, 7 days a week, with minimum attention.

In addition, it gives steadier, constant voltage over the entire load range and higher short-time overload capacity. Supplied as a complete packaged unit with transformer and metal-enclosed switchgear, the installation occupies minimum space.

For information on a G-E Ignitron Rectifier to fit your d-c power needs, ask your nearest G-E Sales office for a copy of bulletins GEA-5539 and GEA-5569 or write General Electric Company, Schenectady 5, N.Y.



Major portion of the power load of this huge store is supplied by the 5000 kw G-E Ignitron Rectifier installation.

524-1

GENERAL  ELECTRIC

on the "UP" and "UP"

Meaning you can **DEPEND** upon a Jeffrey Bucket Elevator if you have material to be lifted so that something else may be done with it. Step **UP** your production schedules . . . bring costs down. In addition, you save time and expense in making layouts and drawings . . . we have worked out a complete line of standards. A type and size to meet your requirements.

Other Jeffrey Products:

Bin Valves
Belt Idlers
Car Pullers
Chains
Conveyors
Coolers
Crushers
Dryers
Feeders
Pulverizers
Screens

Transmission Machinery
Weigh Feeders

Vertical or inclined, with or without casings and with many features for the best of service and economical operation. It is a step forward to select a Jeffrey Bucket Elevator. May we hear from you?

Many features: welded angle casings, improved head and boot sections, removable hood, large inspection doors, increased bearing protection, and others.

It's easy to select a Jeffrey Bucket Elevator. Continuous or intermittently spaced buckets mounted on single or double strand chains or belts.

THE JEFFREY

MANUFACTURING COMPANY

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Complete Line of
Material Handling,
Processing and
Mining Equipment



**IT HAS BEEN AMERICAN BLOWER'S PRIVILEGE TO
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Columbus & Southern Ohio Electric Company	Missouri Power & Light Company
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Duke Power Company	Philadelphia Electric Company
Eastern Shores Public Service Company	Potomac Electric Power Company
Fitchburg Gas & Electric Light Company	Public Service Company of Oklahoma
Florida Power Corporation	Public Service Electric & Gas Company
Florida Power & Light Company	Public Service Company of Colorado
Gulf Power Company	Southwestern Public Service Company
Hartford Electric Light Company	Southern Indiana Gas & Electric Company
Indianapolis Power & Light Company	South Carolina Power Company
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Iowa-Illinois Gas & Electric Company	Tampa Electric Company
Iowa Power & Light Company	Texas Electric Service Company
Iowa Electric Light & Power Company	Texas Power & Light Company
Kansas City Power & Light Company	Tennessee Valley Authority
Kansas Power & Light Company, The	Virginia Electric & Power Company
Kansas Gas & Electric Company	Worcester County Electric Company of Massachusetts

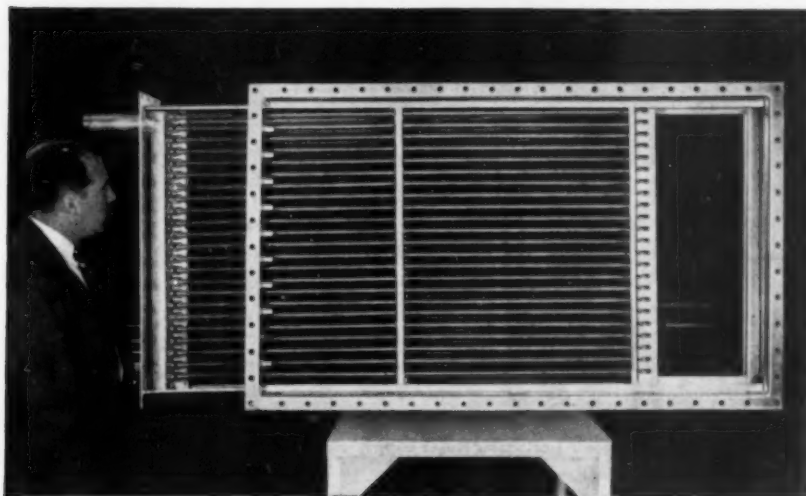
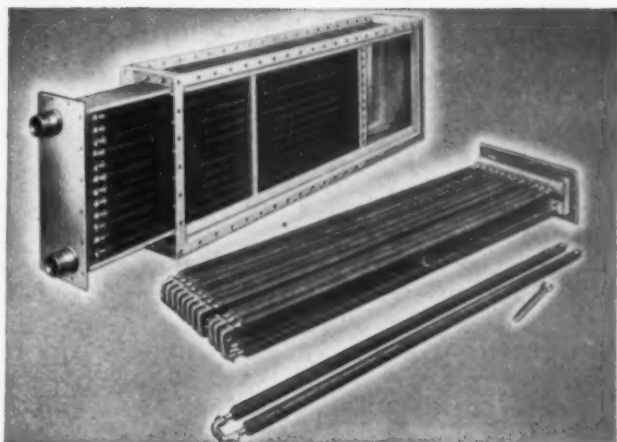
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN

Serving home and industry
AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Facts you should know about

AMERICAN BLOWER HEAVY DUTY STEAM COILS

American Blower's Type H Heavy Duty Steam Coil has been developed for a single purpose: to furnish public utilities and industry with a heating coil designed and built in accordance with highest quality industrial equipment standards. It is a coil possessing strength, corrosion resistance and complete accessibility.



↑ Above, Type H Heavy Duty Coil and component parts. The entire heating element is removable from the casing and can be completely dismantled for inspection, maintenance and repair. Individual tubes are replaceable.

← Type H Coils are available in a wide range of sizes and are designed, tested and guaranteed for operation with steam pressures to 350 lbs. gauge. Casing is heavy steel, welded airtight.

For detailed information on American Blower Type H Coils, write for Bulletin B-1318, or call our nearest branch office.

And if you'd like complete data on other American Blower power plant equipment—Mechanical Draft Fans, Fly Ash Precipitators and Gyrol Fluid Drives for boiler feed pumps and fan control—write, stating your requirements, or phone the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN ROBEY & Standard Savitzky CORPORATION



Gyrol Fluid Drives

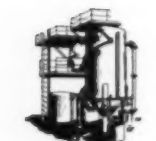
for Mechanical Draft Fans are also a part of American Blower's wide range of products which serve America's leading public utilities.

YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

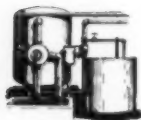
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Your Boilers... *need purer water than YOU do!*



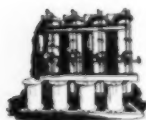
HOT PROCESS SOFTENERS



ZEOLITE SOFTENERS



FILTERS



DEMINERALIZERS



REACTIVATORS

It may be hard to think of your own body as having a tougher constitution than your boiler plant. However, the water from wells and streams that can nourish your body may seriously damage your boiler plant.

Modern, high pressure plants can tolerate only minute amounts of hardness, alkalinity, silica, gases, and other dissolved impurities in their raw water supply. That's why it's so important to be sure of the right water-conditioning equipment for your particular water supply and your individual plant conditions.

You get this assurance with GRAVER equipment. GRAVER's 40 years of specialized experience, and the successful results of many thousands of GRAVER water conditioning installations all over the world provide authoritative recommendations, equipment selection and guarantees. GRAVER'S designs include equipment for every water conditioning process. And GRAVER's pioneering leadership offers you the most modern processes, equipment and materials of proven effectiveness, with many exclusive features.

Write for bulletins and consultation . . . there's no obligation.

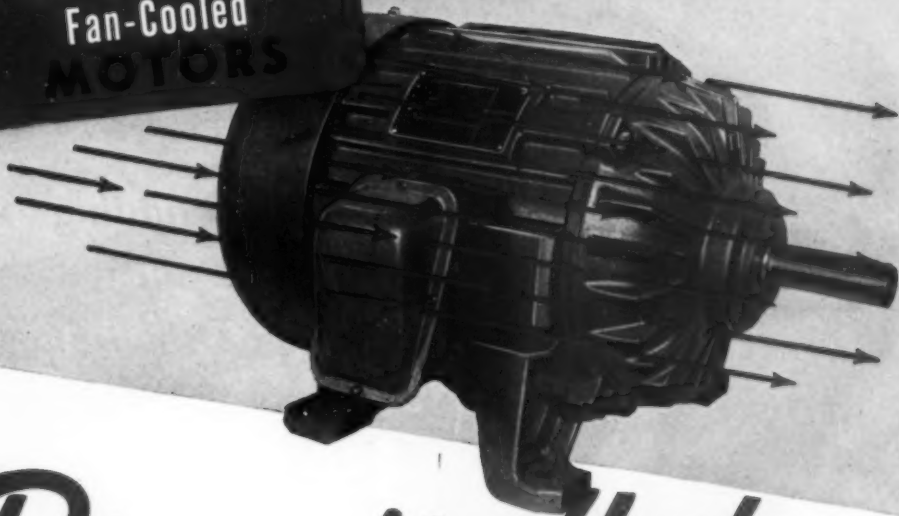


GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.
216 WEST 14th STREET, NEW YORK 11, N. Y.

GW-489

**Totally-Enclosed
Fan-Cooled
MOTORS**



Blows itself clean as a Whistle!

DIRT IS CARRIED AWAY by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor. That means less motor cleaning . . . inspection . . . overhaul!

Concealed air passages and pockets have been eliminated. Dirt can't build up to cause overheating. And as for oily dirt that sticks — just wipe or blow it off.

Studies show that on most applications, totally-enclosed fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3427

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

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Applied . . .

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CONTROL — Manual, magnetic and combination starters; push button starters and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types from 1/4 in. to 72 in. discharge and up.

ALLIS-CHALMERS



*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.



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thousands
upon thousands..."*

FRANK M. FOLSOM
President, Radio Corporation of America

"By a simple person-to-person canvass, we are adding thousands upon thousands of serious savers to our Payroll Savings Plan. Our employees are eager to contribute to the strengthening of America's defenses while they build their own security. They know that individual saving initiative means a blow at ruinous inflation. They know that is the line on which all of us at home can make our strongest fight."

"Thirty days has September." And every one of these September days is a D Day. In newspapers... magazines... over the radio... from the television screen... on billboards... contributed advertising will urge every American to "Make today your D Day. Buy U.S. Defense Bonds."

September days are "D" Days for management, too—*Decision Days*.

If you have a Payroll Savings Plan and your employee participation is less than 50%... or if you have not made a person-to-person canvass recently—consider this your "D" Day.

Phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building,

Washington, D. C. Your State Director will show you how easy it is to increase your employee participation to 70%, 80%—even 90%—by a simple person-to-person canvass that places an application blank in the hands of every employee. He will furnish you with application blanks, promotional material, practical suggestions and all the personal assistance you may desire.

Your employees, like those of the Radio Corporation of America and many other companies will join by the hundreds or thousands because they, too, are eager to contribute to the strengthening of America's defenses while they build their own security. Make it very easy for them—through the automatic Payroll Savings Plan.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

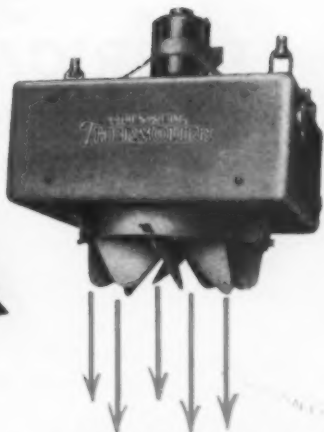
SOUTHERN POWER & INDUSTRY



DOWNRIGHT

better performance

Vertical Delivery
THERMOLIER
Unit Heaters . . .

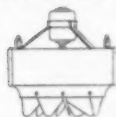


RIGHT DOWN

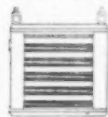
where maximum heat is desired...

in warehouses, plants and other
hard-to-heat buildings

4 MODELS 18 SIZES



Vertical
Delivery



Horizontal
Delivery



Textile
Model



Velocity
Nozzle

A thermostatic trap, the simplest and least expensive of all traps, is practical because of Thermolier's exclusive cooling leg.

Maximum capacity assured, annoying destructive water hammer eliminated — by built-in pitch of tubes and internal cooling leg which assure continuous drainage of condensate.

Damaging strains caused by expansion and contraction eliminated by "U" type expansion tubes.

Safety and durability assured with leak-proof tube-to-header construction.

Five other important construction features. Write for Thermolier Catalog.

HEATING COMFORT AND ECONOMY. Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Thermoliers provide quick heating from a cold start. Desired room temperatures are easily maintained within a close range.

ADAPTABILITY TO EQUIPMENT AND FLOOR LAYOUT. The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily re-located at any time to meet changes in plant layout or heating requirements.

LOW FIRST COST. Thermoliers are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost.

GRINNELL

WHENEVER PIPING IS INVOLVED



Grinnell Company Inc., Providence 1, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
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Homestead-Reiser *Self-Seald* LUBRICATED PLUG VALVES

The Full-Port-Area Valve built to outlast all other lubricated plug valves in the 200 pound working pressure class.

- 100% PORT AREA
- 100% LUBRICANT SEAL AROUND PORTS
- SELF-SEALING
- AUTOMATIC ADJUSTMENT FOR WEAR
- EXTREME ECONOMY OF LUBRICANT

Remains drop-tight for
Up to 22 TIMES
more operations
without Re-lubrication



Self-seald MEANS

... that in addition to a full-port lubricant seal, the wedge action of the plug under line pressure, forces the surfaces of the plug outward, and constantly presses against the seating surfaces of the body, keeping them always in intimate contact. The plug automatically adjusts itself for wear, assuring extra long life, maximum leakless service, and lubricant economy.

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DISTRIBUTORS IN ALL PARTS OF THE WORLD. FOR LOCAL REPRESENTATIVE SEE CLASSIFIED TELEPHONE DIRECTORY

**"NO OTHER OIL
has done this Job!"**

reports
Willys-Overland Forge



Mr. Wm. Paris, Vice President in Charge of Manufacturing at Willys-Overland Motors, Inc. says, "We have saved plenty of cylinders, packing, and down-time since shifting to Sinclair lubrication."

Rising production forced the mammoth Forge Shop at Willys-Overland to set up ram speed 30%. As the power was insufficient, the steam had to be raised to 400° F. by superheating. Then the lubrication problem started!

The hotter steam and faster ram speed quickly burned up packings, and cylinders became scored. Many lubricants were tried. All failed to halt the destruction . . . until the Forge tried Sinclair Valve Oil Light. Now it reports it hardly ever has a scored cylinder and no more lubrication headaches. The Forge does not believe it possible to get finer steam cylinder lubrication and emphatically concludes that, "No other oil has done this job!"

If you have a steam cylinder lubrication problem it can pay you to consult with Sinclair, for Sinclair makes a wide variety of Steam Cylinder Oils to handle every possible need. Get in touch with your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Ave., New York 20, N. Y.



The Forge Shop at Willys-Overland, Toledo, where only Sinclair Steam Cylinder Oil has done the job.

SINCLAIR STEAM CYLINDER OILS
for every steam cylinder installation



IT'S
PACKED WITH
SATISFACTION
WHEN IT'S
PACKED
WITH R/M

Typical of the hundreds of different types of equipment packed with Raybestos-Manhattan packings is this high-pressure rotary air compressor. The complete R/M line includes packings and gaskets for service against air, gas, water, oil, steam, petroleum products, chemicals, food products, and practically every gas or liquid used in industry. Your nearby R/M distributor will help select the proper packing or gasket to meet your needs. Or write for the R/M Packing Catalog.



PACKINGS

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn. Manheim, Pa.
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RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hoses • Powdered Metal Products • Bowling Balls

RECOMMENDED CURE for the high cost of air

... Cooper-Bessemer Motor Driven Compressors

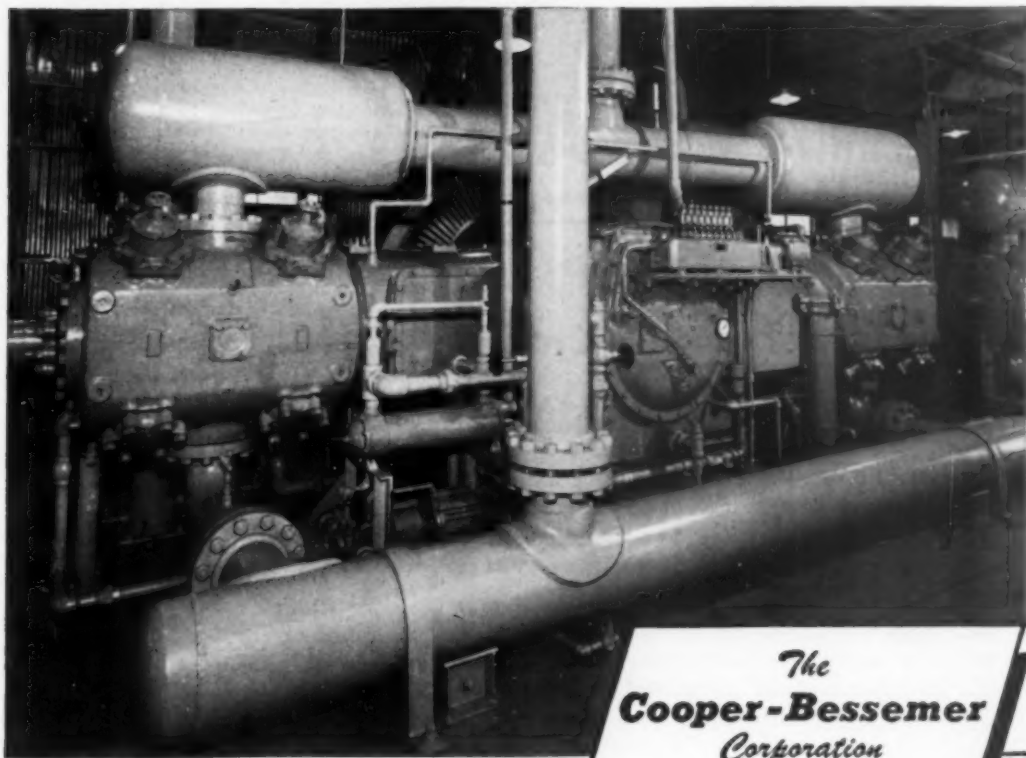
IF your plans call for large scale compressed air on a long-range basis, better have a close look at the savings modern Cooper-Bessemer units offer. Shown above is one of the various types and sizes from 350 to 3000 horsepower.

These motor-driven units, like Cooper-Bessemer engines and engine-driven compressors, are designed and built for years of the hardest service with an absolute minimum of costly down-time. And that's a major gain right there!

Secondly, these Cooper-Bessemers offer you exceptionally high mechanical and volumetric efficiencies, throughout an extremely broad demand range. With such flexibility and efficiency you can turn out more air per dollar.

Finally, these units have unmatched compactness among units comparable in flexibility, efficiency and life! Without sacrificing accessibility or ruggedness, you save on space, housing, installation and piping costs.

Yes, if you're interested in compressing air, get full details . . . add up the money-saving facts on these modern units. The nearest Cooper-Bessemer office will be glad to cooperate.



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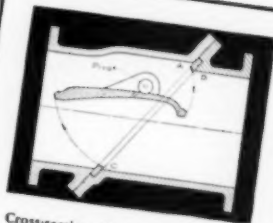
CHAPMAN

TILTING DISC CHECK VALVES

Cut Maintenance Costs with Cushioned-Closing

There's less wear on seating surfaces, hinge pins and bearings with the cushioned closing action in a Chapman Tilting Disc Check Valve. No destructive slamming. No fatiguing flutter. No vibration of pipe lines or adjacent structure — nor danger of opening pipe joints or rupturing pipe lines. Just a quick and quiet closure that cuts maintenance costs.

And what's more, the balanced streamlined discs in Chapman Tilting Disc Check Valves ride smoothly on the stream—reduce head losses 65 to 80% over conventional swing type checks. You'll want to know more about this maintenance-saving, more efficient check valve. Write today for engineering data, Bulletin #30.



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS

Timely Comments



Successful Contracting

PARTICULARLY timely right now, when so much contracting and subcontracting is taking place throughout industry, are the comments of J. C. Cummings of Bryant Electric Company at the Conference on Electrical Application recently sponsored by Georgia School of Technology. Much unpleasantness and confusion can be avoided if the following procedures outlined by Mr. Cummings are followed wherever practicable.

OUR WORK STARTS with the order to do certain work as indicated on drawings and by specifications. We want the drawings and specifications in time for material take-offs and purchases, and the drawings clear enough so we do not have to make new drawings. Also, we want a supplement or letter with the specifications clearly stating the nature and scope of the work, and the conditions under which the work must be conducted. We need to know time limits, and whether production must be maintained during construction.

Next we need a clear understanding about the person in the owner's organization to whom we are responsible for anything pertaining to the conduct of the work—changing in timing or scheduling, revisions, and extra work not covered by contract. This person should be authorized to decide scheduling, cut-overs, etc. This is especially important when work is to be done in a plant that is in operation. It simplifies the job if this person is the only one to issue orders and instructions to the contractor's representative. It is essential that the contractor's superintendent be clearly informed before the start of the work with regard to what field changes he can make without consulting the owner's contact man, who in turn can decide what changes should be referred to the designer.

Our next concern is a safe material storage space located as conveniently as possible to the work site, and a satisfactory method for material receiving.

Next the job superintendent must devote time and study to planning the actual execution of the work, such as tools and equipment, scaffolding, etc. This item alone can easily make or break a job, and must be done before a crew is moved onto the jobsite.

We have found that it pays well to brief a crew at the start as to the scope of work, and run over the plans and specifications—in short hold a "bull session"

explaining anything unusual in the particular job and especially any unusual working conditions required.

When hiring new men, we give each a copy of our working rules showing hours of work, starting time, tools required, material storage, safety rules, and above all conduct towards the owner's representative and employees. We believe in strict discipline as we know one insolent helper can ruin pleasant relations between contractor and client.

Management Responsibility

TWO DEPARTMENTS for which the head of a company has always had to take major responsibility, are finance and personnel. These responsibilities alone have been enough to use about all the ability and energy he had to offer. But now a third burden has been placed on the business head. Let's call it government compliance.

The new burden is great whether the plant be large or small. And like finance and personnel, government compliance is an executive job that cannot be passed completely to subordinates. Penalties and dangers are so great that compliance with government regulations matches finance and personnel in importance.

Thus at the very time when personnel is most important—more capable assistants needed to handle increased work, including government work—the executive has less time available to select and direct his associates.

Then in addition to the strain within business itself, government must call on industrial executives to serve as directors of Federal programs. All of which leads to an explanation of why many plants seem to be slipping below best performance.—"The big boss doesn't come around any more."

What to do about it? Business heads must assume a fourth major function—politics and public relations. Only by taking a strong position in this fourth field can they hope to alleviate the continually increasing burden of record keeping and question answering which are an important element in complying with government demand for more regulation of industrial and business endeavor.

Small wonder then that "The boss doesn't get around to the plant any more."

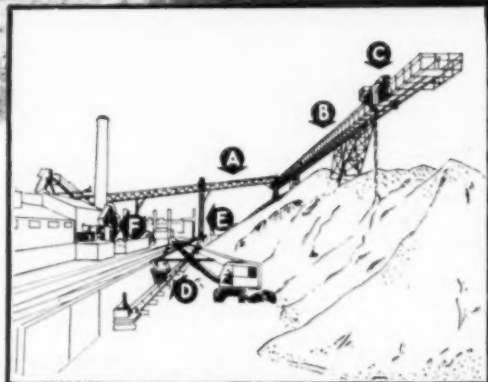


Another Example of Continental's Belt Conveyors at Work -

The Southern Cement Company's conveying and elevating system in their Birmingham Plant incorporates several advanced features of design—one of which is illustrated above and to the right.

Continental's engineers are skilled in "practical engineering" — the kind that results in installations designed for economical, dependable operation and long life. All Continental products — whether especially designed systems and equipment or standard equipment and accessories — show the value of practical engineering.

- Call Continental engineers in on your job — or specify Continental on your next replacement order.



Slag is carried to storage by Conveyors A and B and discharged to storage at any point by self-propelled Tripper, C. As material is needed for processing, it is loaded by shovel onto Reclaim Conveyor D, raised by Bucket Elevator E, and discharged onto return side of Conveyor Belt A., which delivers it to Plant F.

Write for your copy of Continental's new Catalog ID 481, "Continental Belt Conveyors."

CG 4815

INDUSTRIAL DIVISION CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ENGINEERS



ATLANTA • DALLAS • MEMPHIS • NEW YORK



MANUFACTURERS

Industry Speaks

Human Relations and Manpower Discussed at Blue Ridge

E. G. Wilson serving his thirty-second year as Secretary of the (Blue Ridge) Southern Industrial Relations Conference says, "Labor and management are closer together today than they have ever been before".

MEN, rather than money, markets, or machines are the topic at the two conferences on human relations in industry, held annually in the mountains of western North Carolina. The thirty-two year old Southern Industrial Relations Conference and its younger cousin, the Conference of Southern Industrial Executives, set new records in attendance with better than 750 supervisors and personnel men at Blue Ridge and 163 top executives at the one day meeting in Asheville.

The executives, meeting the day before the Blue Ridge Conference, heard William Ruffin, Fred Bell, and H. E. Humphries discuss various problems facing top management during this period of defense mobilization. Ruffin, who is president of both Erwin Mills, Inc., and The National Association of Manufacturers, complained of restrictions on management established by government during the past twenty years and stated that unless this trend of government interference in human relations is brought to a stop, management will lose out as a trustee of the workers.

Frederick J. Bell, Director of Human Relations, McCormick & Company, Inc., said that management, as a part of our system of economy, has a threefold duty: world-wide, national, and within the plant. Nationally, there is no great problem. The average American wants to believe in American Business; it is merely up to management to conduct itself in such a way that belief in it is possible. Within the plant, management must hold onto the right to decide, but this must not be confused with the workers' right to think.

Bell's company started "multiple management", the system through which junior boards of directors are set up to function as advisory groups making recommendations to top management. Of 5000 recommendations made by the junior boards since 1932, 4500 have been adopted.

The company has, through its enlightened personnel policies, reduced turnover to less than 1/2 of 1 percent. The total sales have gone from 3 million dollars in 1932 to 42 million dollars in 1950, and employees get an extra vacation with pay and a bonus at Christmas. "Multiple Management" is the basis for this growth and the industrial harmony.

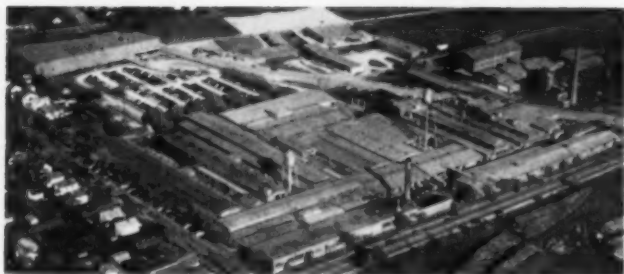
H. E. Humphreys, Jr., President of United States Rubber, spoke on management's responsibilities and attitudes. He said that management men would do well to adopt the attitude that they have just as much responsibility to work for their employees as their employees have to work for them.

This year's **Southern Industrial Relations Conference**, with a total of seven sessions held over a period of three days, had as its theme, "Developing the Most Effective Use of Our Manpower." Eight prominent executives addressed the group on various phases of the problem expressed in the theme. One session was devoted to panel discussions on training, union-management relations, government controls, industrial economics, and industrial recreation programs.

In this thirty-second year of the Conference, all present were again impressed with the sincerity of purpose of the group. It had its beginning as a part of the National YMCA industrial program. In 1919, E. G. Wilson, then a young man, acted as secretary of the first Conference with something less than one hundred representatives present. This year, thirty-two years later, Mr. Wilson still guides the group which has grown to better than 750 representatives of industry from 10 Southern States. The Board of Directors has on it such men as H. Gordon Smith, of the textile division of U. S. Rubber; Ted Forbes, of the Cotton Manufacturers Association of Georgia; Macon Miller, of Fieldcrest; and J. C. Stone, of Tennessee Eastman.

Having watched these conferences and been active in them for so many years, E. G. Wilson is in a position to watch the changes that have come about in management attitude toward labor and labor attitude toward management. As he sees it there is no question that they are closer together today than ever before. Objectives are clearer, and the men at the top have more knowledge of the desires and the abilities of the man near the bottom. There can be little doubt that Mr. Wilson and his Industrial Relations Conference have helped bring this about in the South.

Maintenance at Kingsport Press



Maintenance of its 28 buildings, covering 15 acres, and equipped with the most modern machinery, is a top rated function at Kingsport Press, Inc.

By GUY B. ARTHUR

KINGSFORT PRESS, INC., in Kingsport, Tennessee is the largest establishment in the world manufacturing cloth-bound books on a contract basis, turning out 2,000,000 books every month. To do this day after day and year after year calls for a well maintained industrial plant.

It is not a regimented plant. Colonel E. W. Palmer, President of the Corporation, isn't that kind of executive. His method commands team work. To a marked degree the several departments concerned with

maintenance operate "on their own," coordinating with all other departments which touch their operations.

Maintenance is handled by three divisions, or to be strictly accurate, four. There is no single head. It isn't always easy to tell where one division takes over on a job, and another steps out. The edges of their domains are fuzzy. But not more so than if a single maintenance chief, with his work divided among three or four foremen, had the job of determining where one

began on a job and another finished.

Division boundaries are like state lines to a motorist—they exist, but they don't affect his trip. He drives right on across to his destination. No arbitrary boundaries can be fixed for maintenance jobs, and an attempt to do so accomplishes nothing. In the end all major upkeep must stem from the highest executive authority, and lesser projects are more and more easily allocated and financed as they diminish in importance.

Personnel

In Kingsport Press the Board of Directors is the final authority. A project like over-all painting of the plant warrants action by the Board because of the magnitude and expense of the undertaking. Execution of such a project would be directly under the President, Colonel Palmer. These other officers might all have something to do with it, and the three, or four maintenance chiefs would actually do their parts of the job: Walter F. Smith, vice president and treasurer; E. J. Triebe, vice president and general superintendent; M. H. Daniel, plant engineer; M. F. Suppy, maintenance, machinery; W. S. Stokes, maintenance, electrical; and Weymouth W. Palmer, maintenance, engineering.

In actual practice, the three maintenance departments, plus the Plant Engineer—more often called the Special Projects Engineer—handle the job, for both routine work and emergencies. Each de-

Kingsport Press is one of the "big" industrial plants, especially big for the printing industry. Here are eight of the ten presses in one of the company's press rooms.



partment head does his planning with the others for a job, to fix the part he plays in it. This is particularly true for routine work which can be planned in advance.

A plant that makes 80,000 cloth-bound books every working day is equipped with intricate, fast-moving machinery such as color presses and bindery units. The output of the plant is so tremendous that to have one important machine laid up for even an hour puts a dent in the production program. All the motive power is electrical, so any wiring or motor trouble is serious. A breakdown in such other services as plumbing can be costly. The condition of buildings, lighting, ventilation, and temperature are factors that must be in tune for consistent top production.

System

Good management requires accurate accounting of all maintenance expense, so that the cost of keeping up single machines, or types of machines, can be compared with costs on other equipment. Only with pin-pointed allocation and classification of upkeep expense can management decide when to replace an old machine with a new one of the same kind, or to change over to new and better units.

For machinery, Kingsport Press has about 80 "Standing Order Numbers," for repair and supply charges. Some of the 80 numbers represent all the presses of the same kind, others all the complicated gathering machines in the bindery, and others such critically important units as the linotypes. Some represent single machines. So the 80 numbers give only a meager idea of the amount and value of the equipment in the plant.

No matter which maintenance department does work on any item in the list, the same Standing Order Number is used, and in this way a given department, such as the bindery, has all of its maintenance charged to it. Each kind of machine, and some single machines, have maintenance charged to them automatically. There is no scrambling to get maintenance charges assembled and classified at the end of a month.

In general each maintenance head has a cycle of operations

Kingsport Installs a Linotype Machine

A new linotype machine is to be installed on a Sunday, when the department is not working. The three maintenance heads get together and plan the job from beginning to end. They determine how to work together on the job, choose the men for their special crews and get all preliminary work done, spotting tools and materials near the work area.

Weymouth Palmer, engineering maintenance chief, is likely to spark-plug the job. He arranges for the excavation, the concreting of conduit

trenches, setting of foundation bolts, plumbers, painters and a clean-up crew.

M. F. Supy, who handles all machinery maintenance, assigns his regular linotype expert and possibly one other machinist, with one or more helpers. Electrical mechanics are detailed to the job by W. S. Stokes, as needed.

The three departmental heads time their entrance to the job. The machinists are on hand to set the machine, electricians make the hook-up as soon as the machine is in place, with the clean-up crew standing by to get the area back into working condition for Monday morning.

planned for routine upkeep, apart from installations. Some of this gets close to repair work, and may be hard to classify as maintenance. On the other hand, it's just as difficult to determine how much is repair work, if the job improves or extends the operation of equipment.

Both repair work and maintenance are charged to the latter. Thus there are five machinists on the linotype payroll, three machinists are assigned to the pressroom, five to the bindery, and so on. Mr. Stokes has eight electrical mechanics on his staff, three of whom work



Two of the several maintenance shops in the huge Kingsport Press operation at Kingsport, Tennessee. Some of the machinists are assigned to specific production departments.



at night. He does not assign them to individual operations, but details them as they are needed. This method leaves his force free to maintain the wiring throughout the buildings. He even wired the new building, which has recently been completed.

Engineering maintenance, by contrast, has an easier job in following a cycle of operations. All the janitors, painters, plumbers, steam fitters, firemen, and similar employees, along with laborers, come under this department. The 28 buildings require regular painting, window cleaning, and the like both inside and out. The plant is noted for its brightness inside, making for efficiency, and this exists only by dint of constant cleaning. In this department it is necessary to see far enough ahead to enable the plant executives to plan and authorize work of a major nature for appropriate times. *Weymouth Palmer* operates on such a program and makes recommendations to the president for consideration by the Board of Directors.

The fourth factor in maintenance is the Plant Engineer, *Mr. Daniel*, commonly called the Special Projects Engineer. He has the only

drafting room in the plant and makes drawings for all projects undertaken by the other three maintenance heads. Thus he has a look at all construction and alterations planned.

He is not superior to the other three and does not give them instructions, though he does stand somewhat in the position of the over-all maintenance chief recognized in some industrial plants. He may pull the other three together on a project. Any or all of them may consult with him on plans and projects or have him cooperate with them in the execution of a project. He is free to propose and undertake projects in which he relies upon the other three for support and cooperation.

Between these four are checks and balances which none can ignore. In practice, while each one acts as a free agent, he cannot go far without the help of one or more of the others. It is good administration to let each one stand alone, yet under the necessity of cooperating with the others when his work requires help which the others are set up to give. So, while there is no person giving orders on an over-all basis, there is the higher,

impersonal, demand of the plant itself for smooth, continuous production. That is more imperative and uncompromising than any other kind of compulsion.

Emergencies

An emergency is handled on one of two levels. For a plant accident (breaking of a water main, or anything of that nature), the Engineering Maintenance Department is called at once. *Weymouth Palmer* takes full charge and summons any other persons or departments needed.

Such emergencies are so varied in nature that no one can foresee what may be required, and effective handling depends wholly upon the clear thinking and prompt acting of the person in command. He must have quick responses from everyone called into action, and their intelligent mobilization of tools and equipment.

For a catastrophe affecting the whole plant, endangering the property and employees, such as a cyclone or fire, there is a separate set-up. In such a situation *F. S. Crosley*, Director of Public Relations, is notified at once, and he

(Continued on page 81)

Kingsport Press is the largest establishment in the world manufacturing cloth-bound books on a contract basis, turning out over 2,000,000 every month. Here is the forwarding department

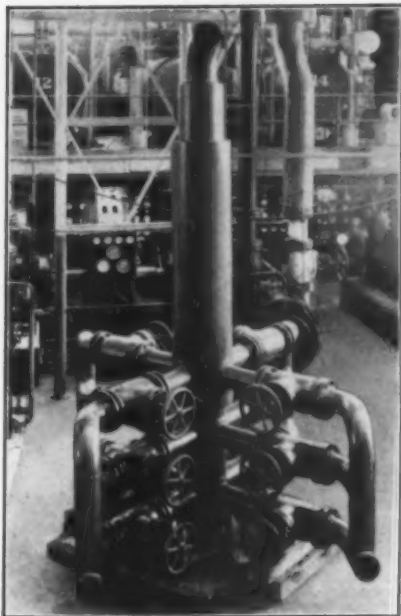
of the binding division. Nearest machine rounds the back of the book, puts the backing on, lines it up and then the headbanding. Putting on the cover is called "casing in".



Celanese in Maryland Adds Compressors

In 1929, the Celanese Corporation of America installed six big Type-J Frick horizontal ammonia compressors in its plant at Amcelle, near Cumberland, Md. In 1933 two more were added. Most of these are 12¼ by 20 by 21-in. machines, having duplex cylinders arranged for two-stage operation; each cylinder is equipped with capacity controls. The motors are of 500 hp and turn at 180 rpm. Five Frick enclosed ammonia compressors were later put in service at the plant.

The equipment chills brine within very close limits in a battery of huge shell-and-tube coolers, each 68-in. in diameter. A row of type-VS condensers stands outside the machine room, which is one of the largest of its kind in the country.



Manifold, mounted above new vertical compressors, will permit any machine to carry either of three pressures.

Three of four new Frick vertical ammonia compressors installed this year at the Celanese plant. Units have four cylinders of 14-in. bore and 12-in. stroke. Two of the compressors are connected through flexible couplings to a synchronous motor

placed between them. Each motor is of 1250 hp and operates at 327 rpm. Couplings were made by the Thomas Flexible Coupling Company and motors by Ideal Electric Company. Compressors are equipped with automatic capacity controls.

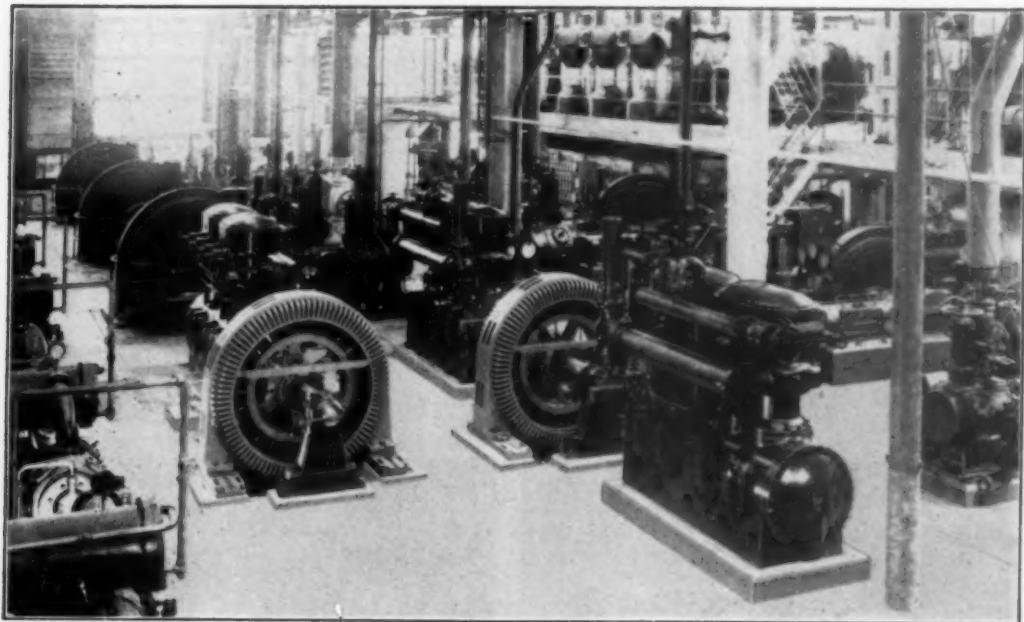
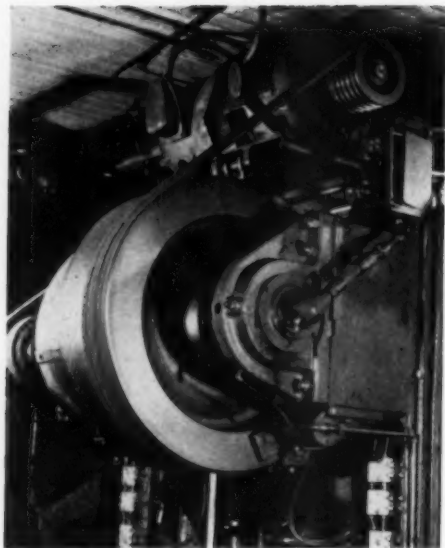


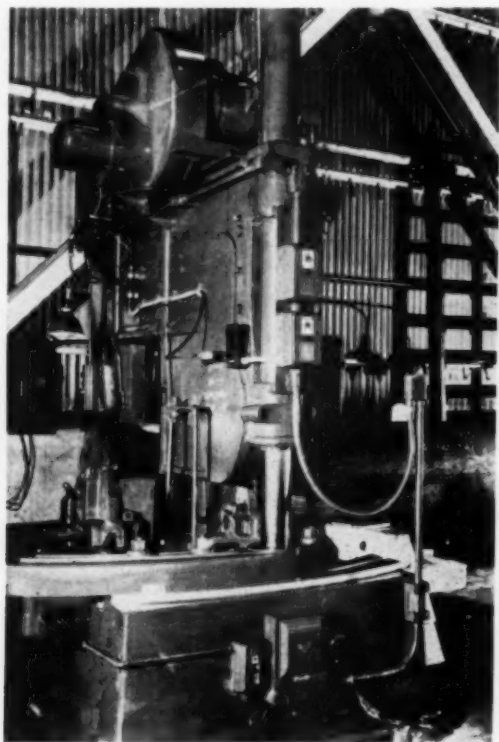
photo-demonstration

Stepless Speed Control

By FRANCIS A. WESTBROOK

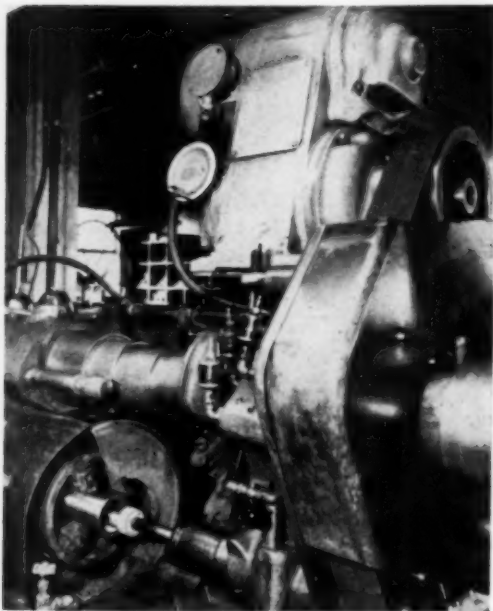


An Adjusto-Spede punch press drive is shown in this Louis Allis photo. Unit is made up of a standard squirrel cage motor and eddy current clutch, controlled through an electronic control panel and push button station. Many modifications are possible. Normal operation is through a 2 to 1 or 3 to 1 speed range, depending on the inertia of the flywheel.



A large Armstrong-Blum power metal saw cutting 22-in. diameter stock is shown below at the left. Drive motor is provided with a Reeves variable speed motor pulley which gives the saw from 20 to 80 strokes per minute, in a stepless range. Number of strokes is determined by type of metal being cut. Adjustment is made by turning a bell crank. Speed is indicated on a plate below the base of the motor.

This internal grinder has been modernized with a Sterling Electric Motors Speed-Trol variable speed drive. It is a 5 hp unit affording speeds between 2000 and 1000 rpm to meet varying conditions.



for Machine Tools

application and production benefits

maximum efficiency is made practicable as the right speed is easily available for each job. Speed can be regulated to conform with the operator's ability. Speeds of various units in a production sequence can be properly synchronized.

Punch press, power saw, grinding and gear shaping applications are illustrated on these pages.

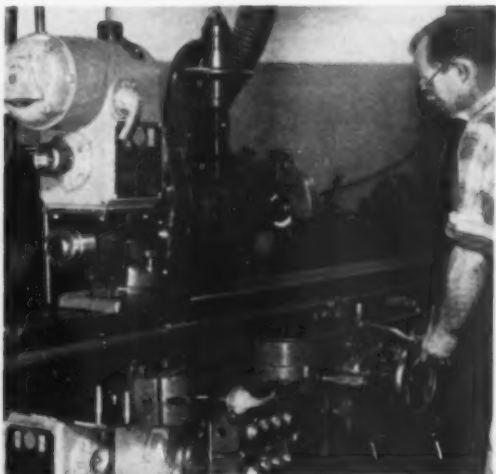
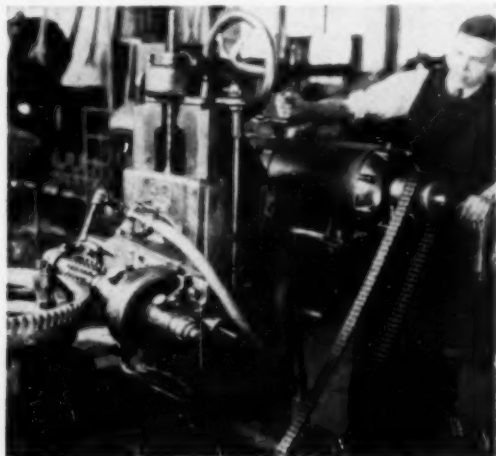
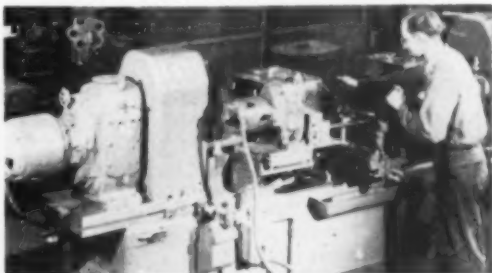
The Simplex Stokerunit four-spindle boring machine at the right is used for turning, facing and chamfering operations. Main drives are through a mechanical variable speed control unit (Link-Belt P.I.V.) with one unit in the separate drive for each pair of spindles on respective sides of the machine. A third variable speed unit on the side controls the drive of the single drill spindle on the auxiliary mount.

The reduction gear may be omitted if not needed and more than one drive is employed. The U. S. Electrical Motors photo at the bottom right shows a specially designed grinder having two fractional hp Varidrive (without reduction gears), one of which drives the grinding wheel and the other the base movement. Thus it is possible to secure the most efficient speed relationship between the two with minimum time and effort.

A Shuchart gear shaper or hobber is shown below driven by a Stephens-Adamson variable speed until through a Morse silent chain. Drive unit consists of a 3 hp, 1200 rpm motor and the mechanical speed changer which operates on the principle of a roller bearing. Within its rating it acts as a positive drive without slipping. Output speed ranges from 120 to 720 rpm and the machine can handle gears up to 36-in. in diameter.



This Fellows gear shaper is equipped with a Link-Belt V.I.P. variable speed control. Speed can be changed to suit the metal being worked or the pitch of the tooth being cut. Overall efficiency can be increased 5 to 30 per cent by variable speed control.





Exterior view of the Houma, Louisiana municipal power plant showing the Maxxim exhaust and intake silencers, gas inlet pipe and Nordstrom gas valves.

Diesel Power at Houma

THREE new gas-burning Diesel generating units went into full operation in June, 1949, at the Houma Louisiana municipally operated power plant. The city financial report for the year ending Sept. 30, 1950, shows generating costs (not including interest and depreciation) were \$67,376.84 for 19,009,600 kwh compared with \$107,715.24 for the 15,671,255 kwh generated and purchased the previous year. With the gas engines in operation, the cost of labor, fuel, lube, maintenance, supplies, repair parts and small tools was 3.54 mills per kwh. The comparable cost of generated and purchased power the year before was 6.87 mills. Thus the difference, 3.33 mills per kwh, was available for interest, depreciation and savings.

The basis for low generating cost inevitably is fuel economy. Total fuel cost for the entire plant was 1.75 mills per kwh. For the gas-burning engines, fuel cost 1.61 mills.

In the 1950 fiscal year, the three new Nordberg gas-burning engines generated 18,783,000 kwh, 98.8 per

cent of the total. The engines consumed 203,099,000 cu ft of natural gas, an average of 10.8 cu ft per kwh. Pilot oil consumption was particularly low, a total of 65,213

Partial Equipment Listing for Plant Expansion

Engines, Nordberg Mfg. Co.; **Alternators**, Elliott Co.; **Scrubber**, Blaw-Knox; **Gas valves**, Blaw-Knox; **Gas meters**, Emco; **Fuel oil**, Standard Oil Co. of Louisiana; **Fuel filter**, Wm. W. Nugent & Co.; **Lube oil cooler**, Ross Heater & Mfg. Co.; **Water pumps**, Peerless; **Heat exchanger**, Ross Heater & Mfg. Co.; **Zeolite softener**, Illinois Water Treatment Co.; **Compressors**, Gardner-Denver Co.; **Gauge board**, Nordberg Mfg. Co.; **Motor-control panels**, Westinghouse; **Switchboard**, General Electric; **Batteries**, Exide; **Air filters**, American Air Filter Co.; **Silencers**, Maxxim Silencer Co.

cent of the total. The engines consumed 203,099,000 cu ft of natural gas, an average of 10.8 cu ft per kwh. Pilot oil consumption was particularly low, a total of 65,213

gal or .0034 gal per kwh. Expressed in terms of heating value, gas provided 10,433 Btu per kwh and fuel oil 468 Btu for a total of 10,901 Btu per kwh. The pilot oil's contribu-

Power Plant Growth—Houma, Louisiana

Most municipal power systems expand gradually to meet the growing demand and, until 1945, Houma followed this conventional pattern. Initially, a steam plant pioneered the system and the city turned to Diesels in 1922 with the installation of two 300 hp McIntosh & Seymour air-injection engines. A 340 hp unit of the same make was added in 1926. Ten years later, the building was extended to accommodate a 1,050 hp

Fairbanks-Morse Diesel, and in 1939, a 1,080 hp Alco-Sulzer unit was added. In 1942, the city bought another engine, but the War Production Board found higher priority need for the unit and it was never delivered.

The city pulled through the next few years with existing equipment but the growing demand necessitated an additional source of power. The only possible source was the private power company and Houma contracted to

purchase power to supplement its own production. From Sept. 1, 1945, to June 30, 1949, the city bought 19,167,453 kwh for a total of \$160,145.89, an average of 8.32 mills per kwh.

Implementing the city's decision to modernize its plant, Houma constructed a wing on its light and water plant in 1949 and installed three Nordberg gas-burning Diesel engines, each of five cylinders, 21½-in. bore and 29-in. stroke, rated at 2,000 hp at 225 rpm. These two-cycle engines burn natural gas with a small quantity of pilot fuel to initiate combustion. They can also operate as oil-burning Diesels.

tion was a lean 4.3 per cent. Lubricating oil consumption also was low, a total of 5,307 gal for the year. With the three engines running a combined total of 19,464 hours, this represented a lubricating oil consumption of one gallon per 7,335 hp hr.

A detergent oil is used for upper cylinder lubrication and a straight mineral oil in the crankcase. Lube is pumped continuously from the sump through a fuller's earth puri-

fier and back to the sump. The lube system for each engine includes a shell-and-tube oil cooler and a motor-driven auxiliary pump used in starting and stopping the engine and as a standby for the main lube circulating pump.

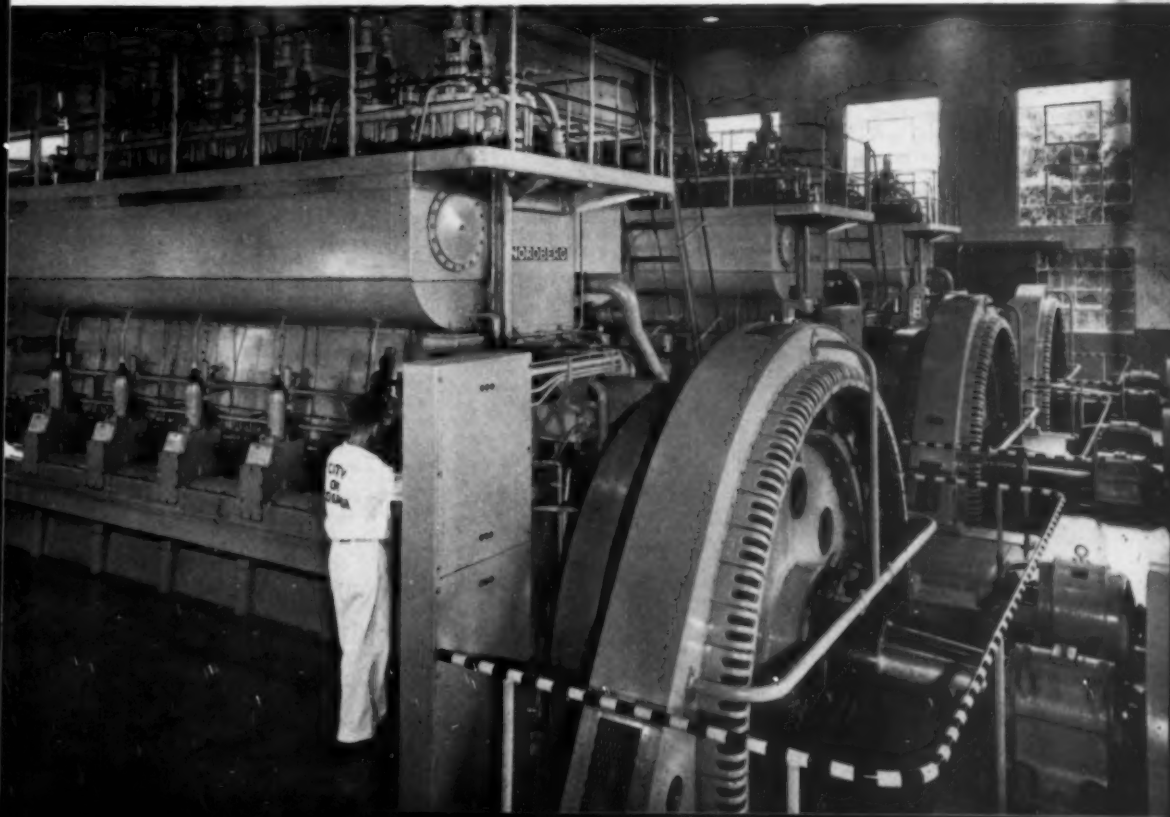
Fuel

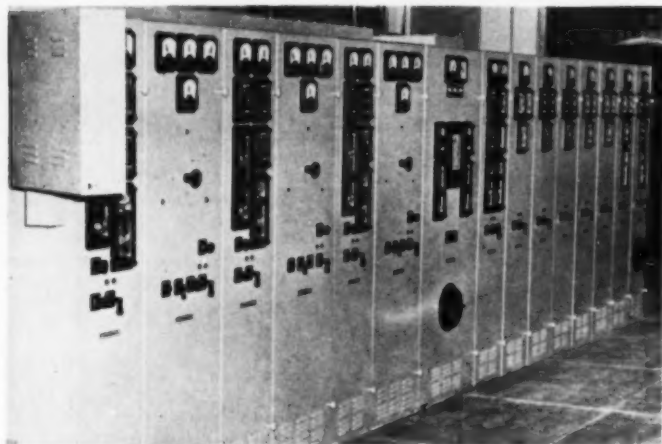
Houma is in the midst of oil and gas country and the natural gas is purchased from a local company. The gas is not processed in a de-

hydration plant and retains many of the light ends. LHV is 966 Btu per cu ft. Reaching the plant at 30 psi, the gas passes through a scrubber, meter and regulator and goes to the engine compressors. There are thermometers in the gas lines to permit a temperature correction in calculating the volume of gas consumed. The engine-driven compressors raise gas pressure to 1150 lb before injection into the cylinders. A motor-driven auxiliary

Three Nordberg two-cycle, five cylinder, 21½-in. x 29-in. gas burning Diesel engines at Houma, Louisiana Munic-

ipal Power Plant. Engines are rated at 2,000 hp each at 225 rpm.





The 15-panel metal-clad G.E. switchboard has electrically operated switchgear. Circuit breakers can be rolled out of the compartment for servicing.

gas compressor can be used if an engine-driven compressor fails. The regular fuel injection pumps serve as gas valve actuators when the engine runs on gas. A separate set of accurate, small-volume injection pump handles the pilot oil. The engines can be operated as full Diesels but the possibility is remote in this gas-abundant location.

Auxiliaries

A pair of motor-driven centrifugal pumps for each engine circulate the cooling water. One pump sends soft water through the engine jackets and through a heat exchanger. The other pumps draw

water from the nearby bayou through the exchanger and then to waste. There are headers on both the soft and raw circuits to permit use of any pump on any engine. Makeup for the jacket supply is treated in a softener. A large overhead water tank serves as protection-against damage through pump failure.

A gauge board near each engine holds pressure gauges, an alarm panel and an exhaust pyrometer. The new 15-panel switchboard is metal-clad and has electrically-operated switchgear. Circuit breakers can be rolled right out of their compartments for servicing. Instru-

Auxiliary equipment for each engine includes a Honan-Crane lube oil purifier, a Ross oil cooler, a Nordberg lube strainer, a Blackmer auxiliary lube pump, Ross heat exchanger and Peerless cooling water pumps.

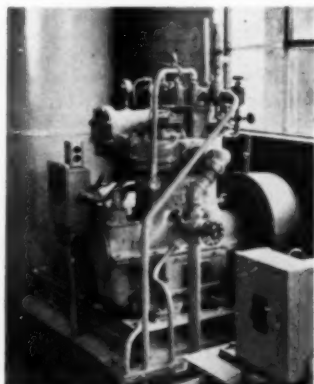


mentation is particularly complete.

Houma spared no expense in equipping the new power plant for this was regarded as an investment in efficiency. This municipal power system has a long record of profitable operation but the new plant is paying unprecedented dividends. In the last fiscal year, after paying cost of production, distribution, administration, insurance, and depreciation, the electric department had a net profit of \$253,308.15.

Load

Houma is a thriving, expanding city of 11,000 population with its prosperity firmly based on oil, fish, fur and sugar cane. This is the shrimp center of Louisiana. The plant serves a wider area with 18,000 population and also an REA cooperative.



1200 lb Gardner-Denver auxiliary gas compressor. The 250 lb air compressor is installed to the right of this unit.

Though the industrial and commercial consumers are important, the recent vast growth of electric load has been primarily a development of residential consumption. In the past few years, home air conditioning has become commonplace and peak power demand has shot up from under 2000 kw in 1946 to more than 5000 kw in 1950.

An important factor in the development of Houma's power prosperity and the construction of its efficient new plant has been the city's administrative team under Mayor Leon Gary. J. C. Pittman is City Engineer and Superintendent of the Light & Water Department.



Pressure and Vacuum Gauges

By E. A. MURPHY

Brown Instrument Division, Minneapolis-Honeywell Regulator Co.

Next to temperature and possibly flow, pressure and vacuum are probably the most important industrial process variables from the standpoint of measurement and control. This seventh in a series of SP&I articles on plant instrumentation covers types of pressures and vacuums, measuring elements and maintenance.

ANYONE who has ever watched the operation of a piece of processing equipment such as a pulp digester, where pressures considerably above atmospheric are at work, has thought at least fleetingly, about what would happen should these pressures be allowed to rise uncontrolled until they exceeded the tensile strength of the processing equipment. Wrecked equipment, damaged buildings, and casualties among operating personnel are quite logical results of uncontrolled pressures.

Uncontrolled vacuums can also be destructive, although on a much smaller scale than uncontrolled pressures. The possibility of harm to plant or operating personnel is fairly remote, and damage is largely confined to the processing equipment itself.

We have talked only about the

destructive power of uncontrolled pressures and vacuums. Actually, this safety factor is usually ranked secondary in importance by the industrial process engineer. He is primarily interested in maintaining all of the process variables at values that will enable the plant to operate at greatest efficiency, and that will insure maximum output.

Take the case of a textile slasher. A slasher includes steam heated cylinders over which pass a number of "ends" or continuous lengths of yarn, which have been coated with a sizing solution. The purpose of the heated cylinders is to dry out these ends until they contain just the right moisture content to possess best weavability. If overdried, they become brittle and the weaver has trouble with frequent breakage in the loom.

The temperature of these cylin-

ders is usually maintained by controlling the pressure of the steam supplied to them. This is quite practical since, in most cases, these temperatures are in excess of 212F, and for every increment of temperature there is a definite steam pressure. This relationship is listed in a set of steam tables, so that the operator, knowing the temperature that he wants to maintain, need only look this temperature up in the tables and read the steam pressure that will give him that value.

We have a process where the control of pressure is critical to product quality. Relatively low pressure steam is employed, and safety or pop-off valves are incorporated in the equipment, so the element of safety doesn't even enter into the pressure control picture.

In like manner, precise control of vacuum is essential to the suc-

pressure and vacuum gauges—continued

cess of operations such as the manufacture of rye whiskey, ethyl alcohol, and many pharmaceuticals; the evaporation of metals and metallic salts; the drying of blood plasma; the evacuation of electronic tubes; low temperature distillation; the extraction of foods, and the recovery of volatile solvents; the im-

pregnation of certain types of materials; and low temperature drying.

The Bourdon tube (Figure 2), is probably the pressure-measuring element most widely used throughout industry. It consists basically of a thin-walled tube which is flattened on diametrically opposite

sides to produce a cross section that is approximately elliptical. The tube is then bent into an arc of a circle, and one end is sealed shut, the other or "gauge end" being left open to receive the measured pressure. This open end is fixed rigidly to an immovable support, while the closed end is left free to move. When pressure is applied to the open end of the tube, the elliptical cross section

Types of Pressures and Vacuums

Pressure is force applied to or distributed over a surface, and is measured in force per unit area. For example, a water pressure of 10 psi means that the water is exerting a force of 10 pounds on every square inch of area of the pipe or container in which it is confined.

Vacuum might be loosely defined as absence of pressure. By definition, it is a space entirely devoid of matter, or a degree of rarefaction well below atmospheric. In other words, if we start to reduce the pressure in a container and continue to bring this pressure down until it passes below atmospheric, we say that a vacuum exists within the container.

Most of us are far more familiar with gauge pressures and vacuums than we are with absolute pressure. Since gauge pressures and vacuums are measured from a baseline or zero arbitrarily established as atmospheric pressure, the next logical step is to define atmospheric pressure.

Atmospheric pressure is the force exerted on a unit area of the earth's surface by the weight of the air or atmosphere above it. This explains why atmospheric pressure decreases with altitude and varies from day to day. Standard atmospheric pressure, based on average sea level conditions, is taken as 29.92 inches of mercury, or 14.7 pounds per square inch. (A pressure 29.92 inches of mercury is a pressure that will support a column of mercury 29.92 inches high.)

Because we have been exposed to atmospheric pressure from the time of birth, our bodies have become so conditioned that it is difficult to realize that, at sea level, a force of about 14.7 pounds is being exerted on every square inch of body surface. This pressure can be forcefully illustrated with the assistance of a fairly thin-walled rectangular varnish can, a hot plate, and some water. The can, uncorked and containing a small quantity of water, is placed on the hot plate

until a steady flow of steam emerges from the spout. If the can is now removed from the burner, a cork inserted in the spout, and a quantity of cold water poured over the outside, the can will quickly collapse inwardly. The reason? The cold water condensed the steam inside the can, leaving a partial vacuum. Atmospheric pressure pressing against the outside of the can did the rest.

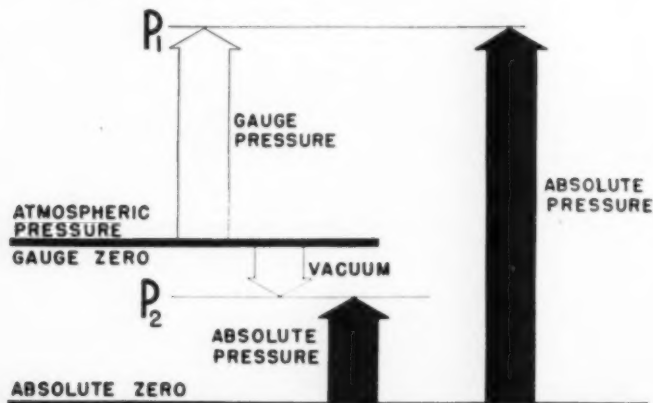
This atmospheric pressure, then, is the pressure actually being measured by the average gauge when it reads zero gauge pressure. In other words, most pressure measuring devices measure the difference between the pressure in a pipe or container, and atmospheric pressure.

As soon as the measured pressure passes below atmospheric, it is known as a vacuum. Here again, the most frequently encountered measuring devices measure the difference between the pressure (or vacuum) within a closed vessel, and atmospheric pressure. In order to convert a vacuum reading to absolute pressure units, the reading must be subtracted from the atmospheric pressure as measured by a barometer. The result then will be a reading directly in absolute pressure. The reason for this is shown in Figure 1 which indicates that vacuums are measured from atmospheric pressure down, while absolute pressures are measured from absolute zero up.

Absolute pressure is based, not on atmospheric pressure, (as are gauge pressure and vacuum) but on absolute zero. To explain briefly what is meant by absolute zero we must refer to the molecular theory of gases. The pressure exerted on the walls of a closed container of gas is caused by the molecules of the gas continuously bombarding the container walls. If we remove more and more gas from this container (i.e., begin to evacuate it) a point will finally be reached where there are no more molecules left and consequently absolutely no molecular bombardment of the container walls. When this happens, a pressure of absolute zero is said to exist within the container.

Fig. 1. Relationship between gauge, vacuum and absolute pressure.

Atmospheric pressure is the pressure actually being measured by the average gauge when it reads zero gauge pressure. As soon as measured pressure passes below atmospheric, it is known as a vacuum. Absolute pressure is based, not on atmospheric pressure (as are gauge pressure and vacuum) but on absolute zero.



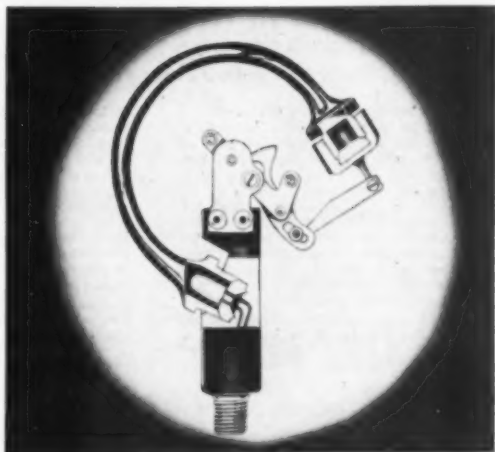
Simplest Pressure Measuring Element

Fig. 2. The Bourdon Tube

This is probably the pressure measuring element most widely used throughout industry. Most of the indicating dial type pressure gauges seen in boiler plants, on air compressors, and in many other industrial applications are actuated by this element. In general, Bourdon tubes are applicable to the measurement of gauge pressures ranging from approximately 15 to 10,000 psi.

Materials generally used for Bourdon tubes are phosphor bronze, beryllium copper, stainless steel and chrome alloy steels. Bronze is most widely used for the lower pressure ranges. In the higher ranges (from 4,000 to 10,000 psi) and on lower pressures where violent fluctuations occur, the various other materials listed are used, selection usually being dependent upon the nature of the fluid being measured.

Chief limitation is its inability to function in instruments which record pressures in the lower ranges. Below approximately 15 psi, the movement of the tube per unit change in pressure is generally too small to cause noticeable pen movement.



Since the outer surface of the tube is subjected to atmospheric pressure, the Bourdon element measures gauge and not absolute pressure.

attempts to return to a circular form and the bent tube attempts to straighten out.

This can be illustrated by laying a garden hose on a flat surface and bending several feet of it at the nozzle end into the arc of a circle. If the nozzle is closed tight and water pressure is admitted to the hose while the end of the arc away from the nozzle is held in place, the curved portion of the hose will partially straighten out, and the nozzle will move an amount that will be roughly proportional to the water pressure applied to the hose.

In the Bourdon tube, the pressure

applied to the open or fixed end causes the free end of the tube to move an amount proportional to the amount of pressure applied. This movement is transmitted through a linkage to a rack and pinion system which both amplifies tube movement and changes it to rotational movement so that a pointer mounted on an extension of the pinion shaft will indicate the measured pressure on a calibrated dial face. In the case of a recorder, tube movement is mechanically amplified and actuates a recording pen in place of an indicating pointer.

No spring is used to balance the

force caused by an increase or decrease in the measured pressure, since the elastic modulus of the tube metal itself is utilized to oppose the force exerted by the pressure. Since this is so, the design of the tube must fulfill two requirements: maximum tube movement must be obtained per unit change in pressure with a minimum of hysteresis (i.e., ability of the tube to return to exactly the same place when the same pressure is reached after the tube has been exposed either to a higher or lower pressure); and the tube must be free from permanent "set" or deformation (i.e., if exposed

The spiral pressure measuring element, shown below in Fig. 3, is in reality a long Bourdon tube wound as a flat spiral. The intermediate pressure spring and bellows element is shown in Fig. 4 at the right.



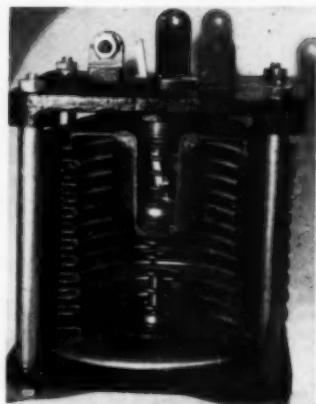
Fig. 5. Low-pressure spring and bellows element

This element is used for pressures and vacuums in the neighborhood of minimum full scale pressure of 5-in. of water up to 75-in. of water, and vacuums with a full scale range of 50-in. of water.

A larger bellows is employed in order to develop the greater force necessary to cause pen or pointer movement when very small changes in the measured pressure or vacuum take place. Measured pressure is piped to the inside of the bellows rather than the outside as shown in Fig. 4.

In the case of vacuum, or compound pressure and vacuum measurement, a lower spring is added (inside the bellows) to oppose the collapsing of the bellows that would otherwise take place when the vacuums were being measured.

Since this element can measure combinations of vacuum and pressure, it is often referred to as a compound spring and bellows element. Bellows movement is translated into pen or pointer movement by a suitable mechanical linkage.



to a pressure within its measuring range), the tube must return to its original or zero position when the pressure is removed.

Minimum Maintenance

Because of its extremely simple construction, the Bourdon actuated pressure gauge requires minimum maintenance. However, since tube movement is transmitted mechan-

ically to the pen or pointer, the linkage should be inspected occasionally for signs of dirt or wear, as either friction caused by dirty pivots, or lost motion caused by excessive wear, will result in errors.

If the measured gas or liquid is highly corrosive, and if seals can not be employed, care must be taken in specifying a tube material capable of withstanding the action of

the measured medium. Where it is necessary to use a tube material which is not immune to the action of the measured fluid, a seal should be supplied to keep the fluid out of the Bourdon tube. One such seal consists of a bellows-like diaphragm which is connected by tubing to the Bourdon tube. The entire system, including the Bourdon tube and diaphragm, is filled with some liquid

Fig. 6. Two-bellows unit measures absolute pressure

As the barometric pressure shifts, the internal mechanism of the unit provides continuous and automatic compensation. Two bellows do the job. They are connected in series, by means of a yoke, to the linkage that

operates the instrument pen or pointer. Upper bellows, which contains the actuating spring, is evacuated to a fraction of a millimeter of mercury pressure absolute and is sealed shut. Consequently, atmospheric pressure

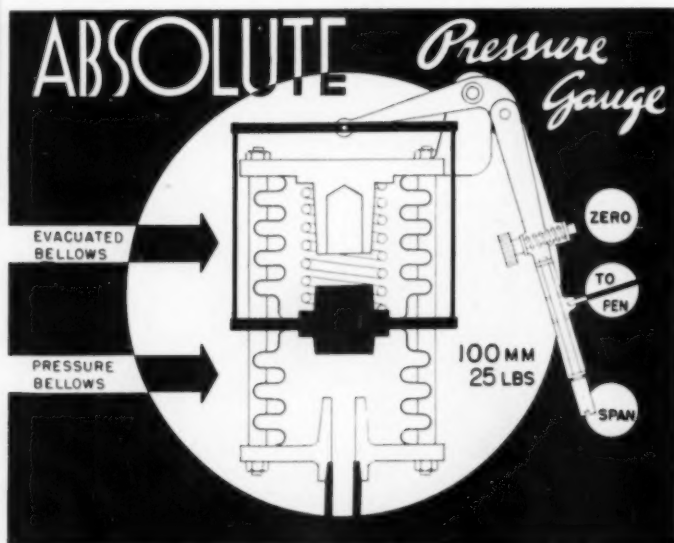
exerts a force against its outer surface and tends to collapse it against the thrust of the inner spring. Lower bellows is connected to the source of the absolute pressure being measured.

As the measured pressure decreases, the upward force exerted by the lower bellows also decreases and both bellows move downward (the lower bellows being compressed and the upper one expanding) forced down by the thrust developed by the spring in the upper bellows.

How does the compensation for a change in barometric pressure take place? Assume that the barometric pressure increases X mm of mercury. This increase in pressure applied against the outer surface of the lower or measuring bellows tends to collapse the bellows slightly, and unless compensated for, will cause downward bellows movement which will move the instrument pen or pointer away from the true measured absolute pressure.

In the case of the absolute pressure element, however, this same increase in atmospheric pressure also acts on the outer surface of the upper or evacuated bellows tending to collapse it and cause upward bellows movement.

Since both bellows are connected in series, and since the forces exerted on them by the change in barometric pressure act in opposite directions, these forces cancel out and the resulting pen or pointer movement is zero. The pen or pointer movement can take place only as a result of a change in the measured pressure.



which will not attack the tube material. The diaphragm, which must be made of material capable of withstanding the action of the measured fluid, is exposed to the pressure to be measured. Changes in this pressure are transmitted by the diaphragm through the liquid fill of the seal to the Bourdon tube.

Every Bourdon tube is designed to work over a specific pressure range. Care should be taken not to subject the tube to pressures in excess of its maximum rating, otherwise the tube may become permanently deformed or "set" with resulting errors in pressure measurement. Extreme overranging or overloading of the tube will, of course, cause it to rupture.

Spiral and Helix Elements

The spiral pressure measuring element (Figure 3) is in reality a long Bourdon tube wound as a flat spiral. In like manner, a helix consists of several turns of a long Bourdon tube. Both operate on the same principle as the simple Bourdon tube, but possess the advantage that the extremely restricted end movement (which required mechanical amplification in the case of the Bourdon element) is no longer a problem.

This is true because, in the spiral or helix, the movement of the free end is a summation of the end movement of a number of Bourdon tubes equal to the number of turns in the spiral or helix element. The result? Ample movement to position a recording pen over a relatively wide arc without resorting to any form of mechanical amplification other than that supplied by the length of the pen or pointer arm.

Chief advantage of the spiral or helix actuated instrument is the reduction in friction, and the elimination of inertia and lost motion made possible by lack of need for any pinion and sector amplifying mechanism. Moreover, the method of connecting the pen or pointer to the pressure measuring element greatly reduces the likelihood of mechanical failure.

Designed to measure pressures in the range from approximately 10 to 4,000 psi, the spiral or helix actuated pressure gauge requires about the same installation precautions

as prescribed for the Bourdon tube. Unlike the latter, however, the spiral or helix actuated instrument presents little in the way of maintenance of pivots or linkage because of the simple construction of the link between the element and the pen or pointer arm. Like the Bourdon tube, the spiral or helix element is unable to handle pressures in the very low ranges.

Measuring Lower Pressures

The chief limitation of Bourdon tubes, and spiral and helix measuring elements is their inability to handle pressures in the lower ranges, since pressure changes in these ranges do not produce sufficient force to cause measurable movement of the free end of the measuring element.

The intermediate pressure spring and bellows element shown in Figure 4 is designed to measure pressures with full-scale values between 100-in. of water, and 15 psig, or vacuums with full-scale values between 10 and 30-in. of mercury. For vacuum measurement, a slightly different bellows construction than shown in Figure 4 is used.

In order to amplify small changes in measured pressure sufficiently to cause pen or pointer movement, this element makes use of the same principle that makes it possible for the pneumatic lift in the corner gas station—utilizing a relatively low air pressure—to lift a car weighing two tons or so several feet in the air. It's the old familiar principle that the thrust developed by a piston or a diaphragm is the product of the unit air or fluid pressure applied to it, times the area of the piston or diaphragm face. For example, if compressed air at 60 psi is applied to a piston with a surface area of 60 sq in., this piston will exert a thrust of 3600 lb.

Referring again to Figure 4, the pressure being measured is admitted through the fitting at the bottom of the bellows shell, and exerts a force upward against the bellows. This force, acting on the outside of the metallic bellows, tends to compress the bellows and moves its free or lower end up against the opposing force of a calibrated spring mounted inside the bellows. A rod, resting on the inside bottom of the bellows, trans-

lates vertical movement into pen or pointer movement by means of a suitable linkage.

Advantages

Spring and bellows elements are very sensitive to small changes in the measured pressure or vacuum. The low range element develops as much as twenty-five times the power of a spiral element for the same pressure change. This is obviously an advantage as this power makes possible positive positioning of the instrument pen or pointer, and is ample to operate an electric or pneumatic control element in the event the instrument is an automatic controller. Moreover, it eliminates any tapping error in the instrument. Tapping error is present in an instrument when small changes in the measured pressure or vacuum do not cause pen or pointer movement unless the instrument case is tapped sharply. The reason for such a condition is that the resisting force of friction developed in the linkage, or caused by the pressure of the recording pen against the chart, is greater than the positioning force developed by the measuring element as the result of a change in the measured variable.

Since the positioning force developed by the spring and bellows element is dependent both on the pressure being measured and the area of the bellows over which this pressure acts, it is obvious that as the pressure range over which the measuring element is to be used decreases, the positioning force can be maintained by increasing the size of the bellows. This is illustrated by Figures 4 and 5. The element in Figure 5 is used in the low pressure range; therefore the bellows employed is materially larger than the one shown in Figure 4, which is used in the intermediate pressure range.

Spring and bellows elements are inherently long-lived, as numerous tests have proved that they will stand millions of cycles of flexing without rupture. Bellows are most frequently fabricated from brass or phosphor bronze, the latter possessing all the advantages of the former, and, in addition, providing increased corrosion resistance. Occasionally some other material will

be employed to obtain still better corrosion resistant properties.

Calibration

In the spring and bellows elements just discussed, the calibration is dependent entirely upon the carefully designed heat treated springs that oppose bellows movement. The bellows serves solely as a pressure enclosure. This is advantageous in two ways. In the first place, the gradient of a bellows (i.e., the amount that the bellows will move as the result of a unit pressure change) is generally not perfectly linear. This means that a pressure increase of one psi at the upper end of the measured pressure range will not cause the same amount of bellows movement as a similar one psi pressure change occurring near the lower end of the range. A shifting gradient of this type would make it extremely difficult to calibrate accurately an instrument whose measuring element relied solely on the bellows gradient.

In the case of the spring, however, proper design and careful heat treating can insure a spring with a linear gradient, i.e., one that will compress or expand exactly the same amount with a one psi change occurring anywhere in the pressure range of the element.

Another advantage of the spring and bellows unit when used for positive pressure measurement is the fact that the range of the element can be changed merely through replacement of the spring. In the case of the low pressure element, used for vacuums or combinations of vacuums and pressure, a range change can be accomplished only by installing a complete new element since one spring is sealed within the bellows itself.

Absolute Pressure

There are many industrial applications where it is necessary to obtain a pressure measurement that is unaffected by changes in the barometric pressure. Typical examples are: low pressure control of fractionating towers in the petroleum industry, and measurement of the vacuum in the final effect of a multiple effect evaporator in a Kraft mill chemical recovery plant.

One method of accomplishing this would be to mount a barometer adjacent to the pressure measuring instrument, and to manually reset the zero or set point of the latter instrument every time the barometer indicated a change in barometric pressure. Obviously, this is not a very satisfactory solution as, in order to insure accurate measurement or control, it would be

necessary to station a man at the instrument continuously in order that corrections could be made for changes in barometric pressure.

In order to overcome this limitation, it is necessary to provide some unit that will continuously and automatically compensate for barometric changes, so that the pressure being measured will at all times be the true absolute pressure. The two-bellows unit shown in Figure 6 accomplishes this job.

Bell Type Gauge

This instrument, illustrated in Figure 7, is used for pressures below the range of spring and bellows units. Application is for pressures in the range of one inch of water that must be accurately measured and controlled. Typical are the pressures existing within kilns and industrial furnaces such as open hearths, where the draft must be measured and controlled in order to assure proper combustion and operation.

Pressures or slight vacuums in this range can not ordinarily be handled satisfactorily by any of the measuring elements previously discussed, for the simple reason that very small changes in the measured variable would fail to develop enough force to reposition an indicating pointer.

Measuring element consists of two cylinders—open at the lower

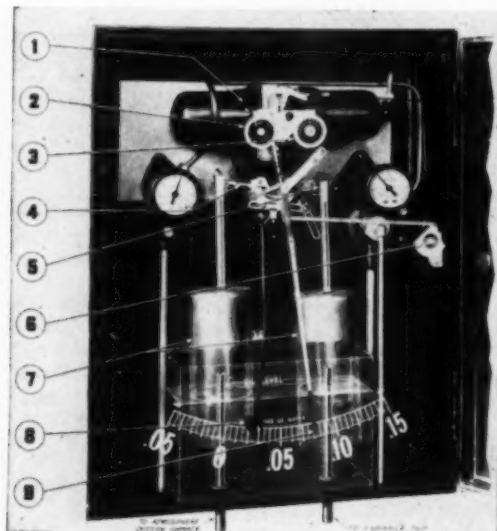


Fig. 7. Furnace pressure controller employing bell type measuring element.

This instrument was designed specifically to measure and control pressures in ranges from -0.05 -in. of water vacuum, to 2-in. of water pressure with a sensitivity of plus or minus 0.0005 -in. of water.

(1) Pneumatic control unit; (2) and (3) control unit adjustment dials; (4) balance beam; (5) pivot and socket; (6) external control setting; (7) oil sealed inverted bells; (8) indicating pointer; (9) control index. Mechanism in the upper portion of the case is a pneumatic control unit. Whenever the measured pressure deviates from the value established by the setting of the control index (9), this unit repositions a stack damper or louvre in a direction which will return the pressure to the correct value.

ends and closed at the top, and known as inverted bells—suspended from the ends of a balance arm, and partially immersed in a tank of oil. In principle, the unit functions similarly to the accurate scale balances seen in chemistry laboratories and in the prescription department of your neighborhood drug store, only instead of weighing solid materials it actually weighs small pressure changes.

A piece of tubing projecting up through the oil and terminating above the oil level inside the right-hand bell is connected to the furnace or kiln whose pressure is being measured.

Since temperature changes along the pipe line conducting the measured pressure from the furnace to the instrument would make the air in the pipe expand or contract, thus causing an error in the indicated pressure, some means of compensating for such changes must be devised. Similarly, some provision must be made to compensate for changes in atmospheric or barometric pressure.

This compensation is provided by means of a piece of tubing which projects up inside the left-hand bell and is connected to a second pipe line which parallels the first or pressure-measuring line, but which terminates near the point of measurement and is open to atmosphere. In this manner any change in barometric pressure or ambient temperature along the pipe lines will result in an equal force being applied to both bells, and consequently no motion of the bells themselves.

As the measured pressure increases or decreases, the upward thrust on the right-hand bell will likewise increase or decrease, causing movement of the finely balanced beam from which both bells are suspended. Hardened pivots and socket type bearings are used in order to minimize friction and enable the instrument to respond to extremely small pressure changes.

Movement of the measuring bell causes the balancing beam to deflect and upsets the highly sensitive zero position of equilibrium, thus moving the pointer, which is attached to the beam, across a graduated scale.

An instrument designed to have

a sensitivity of plus or minus 0.0005-in. of water must, of necessity, be properly installed and maintained if it is to operate satisfactorily. When it is calibrated, great care must be taken to see that it is in a level position, as any variation would cause large errors because of the small pressure spans being measured.

Because it is designed to furnish extremely sensitive measurement, the instrument should not be subjected to appreciable shocks or sudden overloads which will affect its accuracy.

It is by no means a delicate instrument in the generally accepted sense of the word, as hundreds of them are functioning satisfactorily on open hearth floors in steel mills, on rotary kiln control panels in pulp mill recovery plants and cement mills, and on heavy industrial boilers.

Maintenance Notes

The chief enemies of the types of pressure gauges previously covered are: (1) overload, (2) vibration, (3) corrosion, and (4) rapidly fluctuating pressures. These will affect accuracy, cause excessive wear of mechanical parts such as linkages and pinions, and can damage the measuring element itself.

Severe vibration is a common cause of pressure gauge failure. It results in fairly rapid destruction of the gauge since it affects not only the element itself, but also any linkage and sector and pinion employed. The remedy is fairly simple, however: either mount the gauge at a location away from the source of severe vibration, or employ some sort of vibration resistant mounting.

Rapidly pulsating pressures are harmful in that they cause severe and unnecessarily frequent flexing of the measuring element, and also greatly increase the wear on linkages and mechanical parts. In some cases, pulsation is overcome by installing a shut-off valve in the line to the pressure gauge and adjusting the amount of opening of this valve until the pulsations either disappear or become less severe.

The use of a specially designed pulsation damper is the preferred method, however, as it eliminates the possibility of small orifices be-

coming clogged—a situation which can arise when a hand valve is used. Several types of these gauge "snubbers" are commercially available.

Corrosive fluids and atmospheres in contact with the measuring element (either internally or externally) will cause rapid gauge failure unless the element is fabricated of a material that is impervious to the corrosive medium.

One method of keeping corrosive material from reaching the inside of the element makes use of a liquid seal which completely fills the measuring system and is separated from the corrosive liquid or gas by means of a diaphragm. When such a seal is used, great care must be taken to see that no air is trapped with the liquid fill. If air bubbles are allowed to remain in a seal of this type, the air will be compressed when pressure is applied, and the gauge will read incorrectly.

When steam pressures are being measured, it is advisable to place a single coil syphon or "pig-tail" in the pipe connecting the gauge to the steam line. This syphon will trap the condensate and will keep the high temperature steam from reaching the element. Failure to do this can allow all the condensate to run back into the main steam line, thus leaving a clear path for the high temperature steam to enter the measuring element, a situation which can damage the element.

Although most industrial pressure gauges have a certain amount of overload protection built into them, it is poor business to subject a gauge to repeated severe overloads. These overloads place unnecessary strain on the element and, in extreme cases, can even rupture or seriously damage it. When a gauge is installed in a line where there exists the possibility of occasional extremely high pressure surges, it is a good idea to install a diverting relay or a "pop-off" valve in the line to the gauge. In this way, the high pressure surges will either be diverted around the valve, or vented to atmosphere, and the pressure measuring element will be protected from possible damage.

Strain Gauges

Under certain conditions, especially where extremely high pressures are involved, strain gauges

pressure and vacuum gauges—continued

are employed. Operation of this sensing device is based on a law of basic electricity—the fact that the electrical resistance of a piece of wire increases as its diameter decreases.

In order to put this law to work measuring pressure, a strain gauge (comprising a small slip of rag, bone, or bakelite impregnated pa-

per, to the surface of which a wire grid is bonded) is cemented to a surface which will be subject to stress when pressure is applied. As the pressure increases, this surface will be distorted structurally an amount proportional to the pressure, and the wire grid will be similarly distorted. The resulting distortion will cause a change in the

diameter of the wire, and consequently a measurable change in its electrical resistance.

Typical operation is the use of a strain gauge cell for measuring fluid pressures. When pressure is admitted to the hollow cylinder, the cylinder tends to expand in circumference. As a result, the strain gauges cemented to its exterior surface are sensitive to pressure, and changes in their electrical resistance provide a measurement of corresponding changes in pressure.

An electronic instrument is used to measure these changes in resistance. Because of a definite relationship existing between the pressures applied to the measuring cell, and the subsequent amount of structural deformation, it is possible to calibrate the measuring instrument directly in pounds per square inch.

The fluid pressure cell is well adapted for use in the oil and chemical industries where remote indicating or recording is required, and where there is great need for safety. In such cases, the chief advantage of the strain gauge is that the measuring cell can be located up to 1,000 ft from the indicating or recording instrument.

These gauges, which can be supplied to handle pressures ranging from 0 up to 50,000 psi, are suitable for many applications. (1) high pressure pipe testing, (2) testing cylinder pressures on reciprocating engines, (3) obtaining pressure records on penstocks in hydroelectric plants, and (4) recording and controlling pressures in the manufacture of high pressure gases and chemical and petroleum products.

Strain gauges offer the following advantages: (1) since they operate electrically, the distance between the point of measurement and the instrument can be relatively great; (2) no moving parts or mechanical linkages are used, therefore the measuring units are hermetically sealed and are unaffected by moisture; and (3) because of their rugged construction they can be subjected to overloads of as much as three times their normal load rating without suffering any damage.

High Vacuum Measurement

Not too long ago, an absolute pressure of a few millimeters of

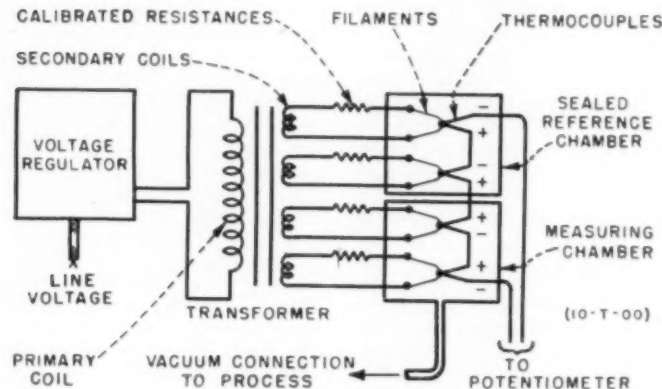


Fig. 8. Schematic diagram of Televac thermal gauge.

In the thermal gauge there is a sealed reference chamber and a measuring chamber which is connected through piping to the vacuum to be measured. Sealed in each chamber are two heating filaments and two small thermocouples which measure

the temperatures of these filaments. There are also electrical provisions to insure that the filaments are heated continuously and uniformly.

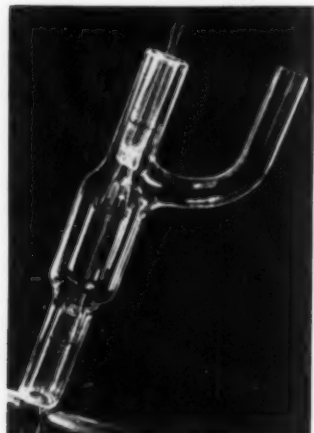
As the vacuum within the measuring chamber increases, the filament temperatures as measured by the thermocouples will also increase. This is true as there are increasingly fewer air or gas molecules present to conduct heat away from the filament to the chamber walls. Conversely, as the vacuum surrounding the filament becomes less, the filament temperature will decrease.

An electronic instrument measures the electrical output of the small thermocouples (which output varies with the measured temperature) and, since the relationship between filament heat loss, and the accompanying absolute pressure valve is definite, provides continuous, accurate, reliable measurement of absolute pressure.

The thermal gauge, which measures absolute pressure in terms of temperature, is used industrially to measure pressures ranging from 0.5 millimeter (500 microns) down to 0.001 millimeter (1 micron) of mercury pressure absolute.

The Televac ionization gauge takes up where the thermal gauge leaves off, and gives accurate measurement of vacuums down to 0.001 micron of mercury pressure absolute.

Fig. 9. Primary detecting element of Televac ionization gauge.



mercury was considered a comparatively high vacuum. Considering the fact that a millimeter is only one twenty-fifth of an inch, this is hardly surprising. Today, however, vacuums of a fraction of a micron are being measured successfully under industrial processing conditions. Since a micron is one one-thousandth of a millimeter, it is easy to see why highly specialized gauges are needed for the measurement of vacuums in this range.

The need for continuous and accurate measurement of these high vacuums on certain industrial applications exists for the following reasons:

- (1) Some processes fail to operate when the pressure becomes too high or too low. For example, in electronic drying, arcing will occur if the pressure within the evacuated system is not held above a certain critical value.

- (2) Damage to products is reduced when leaks or inefficiencies in the vacuum equipment are called to the attention of the operator. Alarm signals actuated by the pressure measuring instrument can perform this function.

- (3) Increased yield and a greater pumping economy result where a process is controlled from a direct measurement of pressure.

In the high vacuum field, most of the gauges employed are of the inferential rather than the direct measuring type. That is, they measure the vacuum in terms of its effect on some other variable such as temperature, or the flow of an electric current. The reason for this is obvious since it would manifestly be impossible to construct a mechanism of sufficient sensitivity to react directly to a pressure change of an almost infinitesimal fraction of an inch of mercury.

Thermal and Ionization Gauge

Typical of the type of equipment used for high vacuum measurement are the *Televac* thermal and ionization gauges. The thermal gauge, shown schematically, Figure 8, makes use of the same broad principle that enables a thermos bottle to keep liquid cold or hot for considerable periods of time. This principle, of course, is the fact that if we continue to increase the amount of vacuum between the

walls of a double walled container (i.e., reduce the number of air or gas molecules present in the space between the walls) we make it increasingly difficult for heat to pass from the inner wall to the outer wall (or vice versa, since heat always tends to flow from the hotter object to the cooler object).

Operating principles of the *Televac* thermal gauge are outlined in Figure 8. The ionization gauge takes up where the thermal gauge leaves off and gives accurate measurement of vacuums down to 0.001 micron of mercury pressure absolute. Molecular action now becomes important.

If electrons, which are emitted from a hot filament bombard gas molecules, the latter become ionized, i.e., they permit the passage of an electric current through them. In the ionization gauge detecting element in Figure 9, are a filament, grid and plate. Electrons emitted from the filament are accelerated to the grid where they remain and are collected. During the course of their travel, these electrons bombard the gas molecules present, forming ions. The ions are collected on the plate, and the ion current, after preamplification, is measured by an electronic instrument. Since the number of molecules present in the detecting cell is dependent on the degree of vacuum, and since this number of molecules is also the

factor which determines the amount of ion current that will flow through the cell, it is evident that accurate measurement of this current is, in effect, a measurement of the degree of vacuum present.

Scope of High Vacuum Field

With the great advances being made in fields of chemical processing, the need for high vacuum measurement is increasing from day to day.

Here are only a few of today's industrial processes where the accurate, reliable measurement of very high vacuums plays an important part:

1. Evaporation of metals and metallic salts, as in the manufacture of magnesium, the surface plating of optical lenses and mirrors, and the metallic plating of cellulose sheets.

2. Drying of blood plasma, penicillin, and other biologicals through sublimation.

3. Impregnation of armature windings, coils, condensers, wood, and textiles.

4. Low temperature drying of chemicals and foods.

5. Evacuation of various types of electronic tubes.

6. Extraction of drugs and foods, and the recovery of volatile solvents.

7. Distillation of vitamin oils, aromatics, and other essential oils.

High Vacuum Process

The question may well arise as to where, in any industrial plant, it would ever become necessary to measure vacuums of such magnitude that it is practically necessary for the measuring instrument to count the individual molecules remaining in the evacuated space.

A typical example is the manufacture of high quality mirrors. In this production cycle, glass is coated with finely divided metal particles. Magnesium or aluminum vapor is deposited on the glass surface under a very high vacuum. Both thermal and ionization gauges are used to aid the operator. The chart record traces the vacuum as it is progressively increased, first by means of the fore pumps, and then the diffusion pumps. It indicates the temporary loss of vacuum that occurs due to outgassing of the diffusion pump oil, and later, the tempo-

rary loss caused by additional outgassing due to a bombardment of the glass surface with a high frequency electrical charge—a step taken to clean the surface of the glass prior to the application of the metal coating.

After the electrical bombardment, the chart shows a continued increase in vacuum until the first evaporation of metal occurs, at which point the vacuum falls off. It builds up again—falls off due to a second evaporation of metal—then recovers. This final recovery indicates completion of the process.

What does the chart do for the operator? It shows him **when** to turn on the diffusion pumps; **when** to start bombarding the glass; and **when** to evaporate the metal. He is not forced at any time to rely on guesswork, and, consequently, is materially aided in turning out a product having consistently high quality.

Steam and Electric Power Service Brought Up to Date at Tallassee Mills

War and peace and passing years have not interrupted production at Tallassee Mills because its managers have kept alert to the need for continuous changes. Modernization is regular practice in this cotton mill which has continued to expand and improve for over 100 years.

By GUY B. ARTHUR

TALLASSEE Mills, at Tallassee, Alabama, is one of the largest cotton mills in the country. It has 82,000 spindles, and employs 2700 persons, making over 3,600,000 lb of cloth and yarn a month.

Its first unit was built in 1844, the second mill in the state, and this unit makes Tallassee the old-

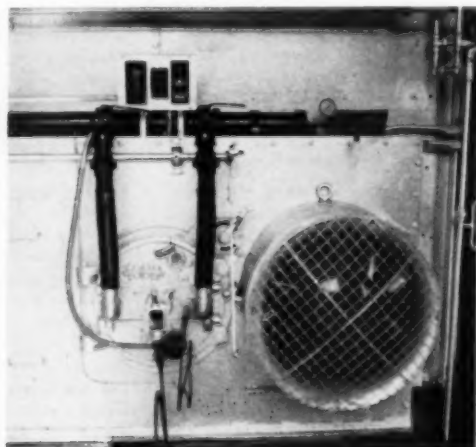
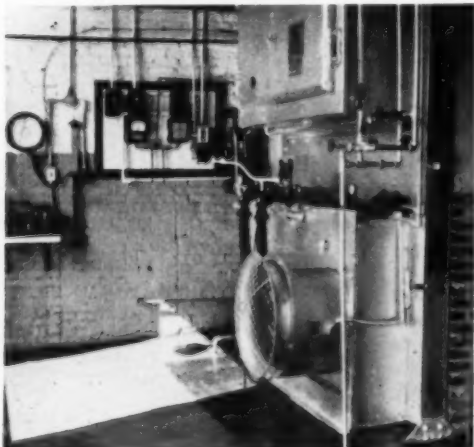
est establishment in the trade in continuous operation. During the Civil War corn and wheat were

ground for toll, and cloth was sold for bacon. The mill made cloth for uniforms from 1861 to 1863.

Two views of the modernized boiler installation. Control instruments are mounted on the wall at left. The Todd gas burner with its piping is shown at right. Directly in the center of the burner plate is an opening where an oil burner pipe may be clamped in place in an emergency. The forced draft fan is at the extreme right.



Master Mechanic W. A. Cottle talks with machinist Jim Hornsby in the Tallassee Mills shop.



Two attempts were made by Union forces to reach the mills and destroy them. In the second raid 13,000 cavalymen invaded Alabama to stop its important industrial production. A detachment set out for Tallassee, with a Negro guide. The guide insisted on taking them over a wrong road, and when the Union officer discovered the treachery the Negro paid with his life. Fearing a meeting with Confederate forces reported near, the detachment kept on the wrong course, and Tallassee Mills was saved.

It has held an important place in every other great need and crisis. In the past war it produced entirely for defense needs, and 3200 men and women employees were the Navy "E" for consistently excellent performance.

This plant has pioneered a number of important innovations, such as turning from coal to natural gas under the boilers eight years ago. At that time the price of coal at the mine was \$1.65 a ton. During the period in which Tallassee Mills has been using gas fuel, the price of coal has risen steadily and as a result more and more plants are following the Tallassee lead. This area is served by Southern Natural Gas Company, in Birmingham, which pipes its gas from Monroe, Louisiana.

Boiler Improvements

Steam for heating and processing is supplied by three Heinie water tube boilers, each rated at 170 hp, fired with gas burners. Two years ago, just after two of the boilers had been overhauled, it was decided to change the third boiler over to a new type of firing equipment.

W. A. Cottle, Master Mechanic, planned the new firing installation from two standpoints. First, he determined to do everything for the boiler set-up in general to improve the operation. Second, he wanted to give the new firing system the very best conditions for success.

He set the boiler so as to give 6 ft 6 in. of clear space between the floor and the boiler shell. The outside wall supporting the boiler was made 8 in. thick, of red brick. Inside this an insulating wall was

laid up of vitreous material, Pli-brico, 10 in. thick. The old floor was covered with 4 in. of firebrick.

A Todd gas burner, made by the Todd Shipbuilding Company, was installed at the center of the fire-box. The force draft fan is set in at the right. All control instruments are grouped on a panel on the wall near the boiler.

Every part of the system is under perfect control. Copes regulators govern the flow of feed water to the boiler. Minneapolis Honeywell devices guard the operation of the gas burner. A Uehling Instrument Company's system controls the amount of air delivered by the fan. Charts from the recording instruments show unusually uniform curves.

The installation has been entirely satisfactory. It has given no trouble, and has proved to be almost automatic in performance. The improvements cost about \$5000 and have saved money from the beginning. The amount of this saving cannot be quoted, but is several hundred dollars a month.

No outside endorsement of the new system can improve on Mr. Cottle's intention to change the other two boilers over in the same way at an appropriate time.

The new system has increased the output of the boiler plant so

much that only one boiler is run in the summer for processing, and only two in the winter when heating is added—thus leaving one unit for a stand-by. This gain in stability and steadiness of operation is most important, for besides the change in steam required



The tunnel, showing the cables mounted on racks which are bolted to the concrete walls.

J. V. Thompson, Chief Mill Electrician, standing in front of the switchboard which he helped to install. The big circuit breakers are in the two panels at his left, and the two halves of the switchboard are symmetrical around this point.



by seasonal climatic fluctuations, there is also the plus and minus fluctuation due to the output of cloth. The added flexibility pays dividends, and is alone worth all the cost of the new firing system.

One of the difficulties in making the new system work at its best was air leaks through the brick walls of the boiler. Cracks and holes so small that they were not visible to the naked eye were let-

ting air through the walls. These leaks were detected by holding a lighted candle close to the wall. When the flame bent inward the spot was marked, and the leak plugged with fine cement grout.

Electrical Distribution

The mill has also built a new sub-station to deliver purchased electric power to the mill. The new switchboard was built by General

Electric in its Philadelphia shops at a cost of about \$50,000, and the 33 three-conductor cables are carried into the mill through a tunnel.

The two new 5000 ampere main breakers are the first of this type to be built by GE. They have an interrupting capacity of 100,000 amperes each. The switchboard distributes power—550 volts, 60 cycles—for the two mills, from two transformer banks of 3750 kva each, stepped down from 13,800 delta to 500 volts delta.

The tunnel is 150 ft long. It makes one right angle turn, and drops ten feet in its course. The 33 cables, in 500,000 circular mil neoprene conduits, make three right angle turns from the tunnel to the switchboard. They are carried through the tunnel on racks bolted to the wall, three cables on each rack, leaving a 26-in. walking clearance between the racks jutting out from the walls. Where they leave the racks to turn up into the switchboard they are clamped to the wall singly. The tunnel is equipped with safety lights, and is cooled by a fan hung from the ceiling at the right angle turn.

Eight reels of cable were used, 560 ft to the reel—a total of 4480 ft, costing \$17,000. The length was estimated so closely that only 40 ft remained after the 33 cables had been cut to lengths from 110 to 165 ft. No new cable was spliced.

Getting the old cables out of the concrete was a dangerous job, for they were laid in three-inch pipe on six-inch centers, and the pipe was badly rusted. The pipes had to be dug out while the cables were fully loaded, and a slip of one of the air hammers would have been disastrous.

This job cost about \$100,000. It was scheduled to require 10 days for completion, but the crew went at it with so much vim and efficiency that it was done in six days.

Tallassee Mills has had a long and eventful history, operating alone at first, then in various partnerships, and finally combining with other units to form Mt. Vernon-Woodberry Mills, of Baltimore, Maryland. Mr. B. G. Stumberg is the Agent, with offices in Tallassee Mills.

Hot Sticks—Tools of the Trade

HOT-LINE poles made by extruding tough Tenite plastic over a wooden core are being used in work on high voltage electric lines. The poles, available in diameters of 1¼-in. to 2½-in. and lengths from 2 ft to 20 ft, are fitted with various attachments and tools for such operations

on high voltage power lines as changing insulators, fusing transformers, removing hot-line clamps, operating switches, etc. The plastic has good dielectric strength and has been satisfactorily tested numerous times at 75,000 v and higher potential-per-foot for 5 minutes.

This Tenite-coated hot-line pole was manufactured by James R. Kearney Corporation of St. Louis; Extrusion by K-S-H Plastics, Inc., of High Ridge, Mo.; using cellulose acetate butyrate Tenite, a product of Tennessee Eastman Company, Division of Eastman Kodak Company, Kingsport, Tenn.



Preventive Maintenance for Processing Plant Equipment

By FREDERICK R. GRUNER¹

PLANNED maintenance chooses the most convenient and least expensive time to do necessary maintenance work. The full productive ability of machines can be assured through periodic inspection which will allow making necessary repairs before serious failure can shut the plant down.

At one large plant where the writer spent much time during a rehabilitation program, after prolonged shut-down, the amount of breakdown maintenance was fantastic. With all the overtime, the maintenance men were the highest paid men in the plant. But even with this high pay, they were not happy because they never knew when they would be called out to the plant. The master mechanic worked night and day, seven days a week, trying to get ahead of breakdowns but eventually gave up and quit. "Life was too short," to work under conditions like that.

The answer was to shut down the plant for a sufficient period to make permanent repairs on the important machines in an orderly manner. Once this was accomplished, minor repairs could be made during operation and a planned maintenance program was put into effect. This plant is now operating with very little emergency overtime, much less maintenance expense and is in continuous production.

Causes of Trouble

The principal causes of maintenance and repair are: improper installation, wear, overload, inadequate lubrication, corrosion and stress, concentration, improper lineup, and vibration.

Improper Installation

The first is improper machine installation. Strict attention should be paid to the manufacturer's rec-

Even under best conditions, working parts of processing equipment are subject to continuous wear. But this wear is predictable and repair work is subject to planning and scheduling.

ommendations. If the information you have on drawings or in bulletins is inadequate, insist on more information. A poor installation can wreck the performance of a good machine.

Attention should be paid to the feed arrangement. Is it large enough for requirements? Will it distribute the material evenly as required? Will the discharge conveyors handle the product without the danger of material backing up and plugging the machine? If possible, have electrical controls interlocked so that the discharge conveyor cannot be stopped without the feed (and if necessary the machine) being stopped.

Metal detectors should be incorporated if tramp iron is a hazard. Chutes and most conveying devices should be easily removable to prevent their damage when major repairs are made.

Much maintenance time can be saved by providing adequate supporting beams for hoists or block and tackle to handle heavy parts conveniently and safely. All parts that must be inspected and lubricated periodically should be easily accessible or they will not be serviced.

Wear

Maintenance becomes excessive when wear is caused by dust and dirt entering into moving machine elements. Worn dust seals or material plugging up a machine will force fines through normal clearances between operating parts. Another cause is the use of lubricants

in which abrasive dust has accumulated.

Overload

Most machines can take a small overload continuously and larger ones intermittently but overloads such as those caused by a dipper tooth going through a crusher will strain or damage bearings and gears, and stresses will be increased in the machine frames, shafts and other parts. Continued overloads, if not instrumental in rapid failure of a part, will certainly seriously reduce the useful life of a machine.

Inadequate Lubrication

Manufacturers' instructions regarding lubricants and lubricating periods should be followed carefully. Much time is spent by the manufacturer in cooperation with leading oil companies working up the lubricant specifications. It is dangerous to experiment. The specification of the correct lubricant is today a very complex problem. Many types of oils and greases are available and many factors must be considered such as lubricant viscosity, operating temperature, oxidation stability, filtering qualities, the effect of extremes of climate when machines are in unheated buildings or outside, film strength necessary to carry the load (particularly on gearing), the corrosive effect of the lubricant on the various kinds of materials used in the machine, etc.

¹ Special Assistant to Manager, Processing Machinery Department, Allis-Chalmers Manufacturing Co.

Corrosion & Stresses

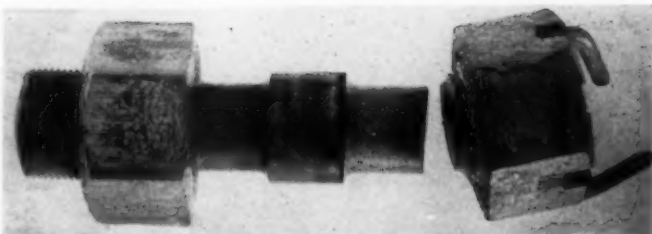
The effect of corrosion on the strength of machine elements is not generally appreciated. Most failures in machine elements occur as fatigue failures. This type shows up very much like a brittle material fracture. A crack starts at some spot (generally on the surface) due to a corrosion pit, notch, oil hole or key way. Under the repeated load of alternate tension and compression, this crack progresses through the part.

Corrosion can reduce the fatigue strength of a part as much as 70 per cent. Plain tap water running over a rotating shaft can reduce the strength of the shaft compared to its dry uncorroded polished condition as much as 50 per cent. Salt water or other more corrosive water can have more serious effects. For this reason it is important to keep highly stressed machine parts such as coil springs, etc., free from corrosion to prevent rapid failure.

On the Mesabi Iron Range, heavy steel coil springs supporting a large vibrating screen were failing every two to three weeks. Metallurgical examination showed corrosion fatigue failure. Inspection of the installation showed highly corrosive wash water running over the springs. This was corrected and new springs installed. These springs have been used for several years.

Improper Line-Up

Machines that have a drive with separate bearings resting on con-



Side view of bolt failure after Magnaflex testing. This inspection brings out presence of surface cracks near starting point of fatigue failure. Characteristics of cracks indicate excessive shear stress set up when tightening the nut.

crete or steel foundations are highly susceptible to misalignment, examples of this are ball mill and rotary kiln drives. Present design practice is to incorporate flexible couplings in the drive to minimize this effect, however, this does not remove the necessity for accurate line up and constant watchfulness in this respect during operation. Gears and pinions should be accurately meshed with proper operating clearance. It is better to have a little too much backlash than not enough.

Our company does a very good business in repairing pinions for kilns, coolers and mills. Many of these pinions are replacements for those which had a long service life. Others replace relatively new pinions that are meshing improperly.

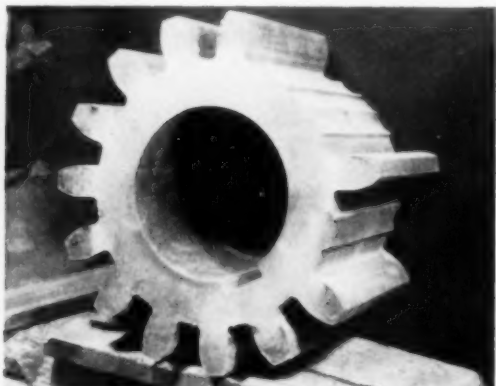
Vibration

Vibration is the enemy of long machinery life. When vibration appears, something is wrong and trouble will develop sooner or later.

Vibration can be caused by rotating parts out of balance, poor or worn gearing, poor line up, or inherent design characteristics of the machinery or its supporting structure. Some machines, by their duty, are inherently sources of vibration such as gyratory and jaw crushers, vibrating screens and conveyors. Unless massive foundations are possible, the only recourse is to isolate these machines from the structure by use of coil springs, rubber vibration mountings, or suspension cables with or without springs depending on the plane of movement of the machine.

As rotary kilns became longer and were being operated at higher speeds, vibration became a serious problem. This kind of service has called for more accurate gearing. It was necessary to make a very complex analysis of the kiln and drive to eliminate operation within the critical speeds. This is the task of the designer and builder but at the same time, this precision equip-

A worn, cast iron grinding mill gear is shown at the left, which could have been reversed to contact new tooth profile. Cannot be reversed now since teeth are greatly weakened due to wear. Illustration at the right shows pinion teeth broken from kiln pinion. Improper meshing caused pinching of gear and pinion teeth. Note that tooth failure progressed from both sides of the tooth.



ment must be carefully inspected periodically to insure proper operation and long life.

So much for general remarks, let us now review some specific types of machines with suggestions on preventive maintenance.

Gyratory Crushers

The shovel operator should inspect the dipper teeth every morning to be sure none are loose and will later get into plant machinery.

Particular attention should be given to the feeding arrangement. A distributing plate should be used above the crushing chamber to insure uniform wear on the crushing surfaces. Chutes or spouts should be arranged to minimize segregation of fines.

The crusher setting should be checked with pieces of lead dropped into the crushing chamber about 90° apart. The dimension of the crushed lead is the close side setting of the crusher. Under no conditions should this dimension be smaller than that recommended by the manufacturer.

If it is necessary to introduce water into the crushing chamber to keep it clear of sticky material, regulate the water flow carefully so that water does not back up into the crusher dust seal and contaminate the lubricating oil with abrasive material.

In large gyratory crushers, with segmented concave liners in the crushing chamber, care must be taken to inspect and maintain the proper spacing of these parts. Manganese steel flows under pressure and it must do this to work harden. After a period of use, the clearance will be taken up between the segments and if not corrected, the force caused by this flowing of the liners can break the main frame of the machine particularly if made of cast iron. Periodically these spaces should be opened up with a torch. An improved manganese steel called Mantalloy has been developed which has greater resistance to flowing and has been very successful in use, however, this must be checked too, but at longer intervals.

Jaw Crushers

The same general remarks hold for this type of crusher as men-

tioned for gyratory machines. The main trouble points with these machines are the pitman and main bearings and the toggle ends and seats. The toggle ends should be covered over with a piece of old belting to prevent dust from mixing with the lubricant and wearing the surfaces excessively.

New type rolling toggles have now been developed by our Company that require no lubrication. The main and pitman bearing lubrication must be carefully maintained and the supply of cooling water must be ample. Babbitted bearing temperatures are not to exceed about 130°F. Automatic lubrication systems are being used to a greater extent and are standard equipment on our heavy duty jaw crushers.

Vibrating Screens

This type of equipment undergoes just about the most severe mechanical service of any machinery in a modern processing plant. A vibrating screen is in effect a continuous fatigue testing machine on all the materials used in its construction. The bearings get the most severe service and, therefore, must be maintained with utmost care. Dust seals should always be in good condition and lubrication instructions followed implicitly. If the screens are operating on more than one shift, this should be taken into account in the inspection and lubrication procedure. Grease fittings should be carefully wiped off with a clean cloth before applying the gun. The grease should be the highest quality obtainable and absolutely free of contamination.

Oil lubricated mechanisms such as the "Low-Head", should have lubricating oil adequate for the temperature limits of operation. This is clearly shown in the manufacturer's instruction book. Remember the old adage that every 10 degrees over 140°F operating temperature reduces the useful life of the oil about 50 per cent. If screens are operating in high ambient temperatures, discuss your particular problem with the manufacturer giving the most accurate data you can.

Check the bearings periodically to be certain they are not turning in the bearing housings because this leads to rapid bearing failure

by destroying the bearing line up. Bearing trouble can be detected by an increase in noise in the mechanism evidenced by a high pitch "whine". If they are very bad, a clatter can be heard.

In assembly and disassembly, be sure that this is done in a clean place. Inspect rollers and races to be sure no spalling and peening has taken place. Spare bearings, housings and other vital parts should be on hand to be used when necessary. Dowel pins and holes should be of the proper size to locate both parts of the mechanism together accurately. These pins are the sole means of lining up the bearings. Consider that this mechanism is built more precisely than many watches on the market and that tolerances on the parts such as bearing bores, etc., are a few ten-thousandths of an inch—1/10 as fine as a human hair.

With all this precision, it is a rugged mechanism and will last many years if properly maintained.

Generally on vibrating screens, nuts should be checked over weekly after the initial shakedown "tightening up". Screen cloth should be correctly tensioned and if fine mesh cloth is used, but not giving proper service, a backing-up cloth can be used. A double tensioning device has been developed to individually tension both cloths. A protective cloth of large mesh and heavy wire can be placed over the top of the fine mesh also.

Nuts on studs holding the mechanism elements together on each side plate, should be correctly tightened. Throw away the extra long-handled wrenches and pipes which when used only stretch the bolts and destroy the purpose of fitted bolts. When using wrench kits, the single-ended wrench supplied is designed for the biggest bolt size. Good judgment should be used with this handle on the smaller bolt sizes. See the accompanying table below for proper wrench forces.

Bolt Tightening Data

Bolt Size	Length of Wrench
1/2"	7 3/4"
5/8"	9 3/4"
3/4"	11 1/2"
7/8"	13 1/4"
1"	15"

The vibration of the screen can be checked for uniformity by fast-

Bolt Size	Thds. Per Inch	Torque to Reach Yield Pt. of Bolt
$\frac{1}{2}$ "	13 thds/in.	55 ft. lbs. torque
	20	55 " " "
$\frac{3}{8}$ "	11	110 " " "
	18	150 " " "
$\frac{3}{4}$ "	10	180 " " "
	16	160 " " "
$\frac{7}{8}$ "	9	260 " " "
	14	260 " " "
1"	8	380 " " "
	14	400 " " "

¹ Marks Handbook—Fourth Edition, Page 1086. Recommended box wrench length.

² Article "Clamping Force of Bolts" from Product Engineering, Dec. 1947.

ening pieces of card board or paper to the side plates at each corner with adhesive tape. A pencil with a sharp point held firmly or in the end of a stick resting on the floor will give a good diagram of the screen motion when moved slowly across the paper. If all corners do not have the same motion, twisting is occurring in the screen frame and trouble will occur with the side plates or cross members of the screen support deck. When the motion is not uniform, the screen supporting springs should be checked and adjusted for equal compression. Rivets and welding on the screen should also be checked for looseness or cracks.

Grinding Mills

Grinding mills, though large and requiring up to 1000 hp are relatively simple machines. The general remarks concerning drive and pinion and gear line-up apply especially to mills because of the large horsepower usually involved. The gearing is the principal source of trouble. Extreme care should be exercised to prevent slurry or dirt entering the gear guard.

On mills in cement and chemical plants, most gears and pinions are completely enclosed in a lubrication housing. The housing has a felt seal which bears against an extended rim of the gear. Care must be exercised to keep housing and felt seal in good condition. If not, the opening between the seal and the gear will allow the entrance of dust. Dust and dirt mixing with the gear lubricant becomes a "lapping compound" which will cause rapid wear.

Vibration due to poor line-up or poor gearing is responsible for many cracked floors and foundations. Bearings should be checked periodically for line-up since founda-

dation shifting will cause unequal loading and ruin the babbit.

It is a wise precaution to paint concrete foundations with an oil resistant paint. Oil spillage and leakage can cause rapid deterioration of concrete.

Periodic inspection of the liners will save replacement of costly heads and prevent damage to the shell. Unless division heads and diaphragms are zinc plated, a race may start which will abrade the shell. At one of our customer's plants a race at the division head wore $\frac{3}{8}$ " into a 1-1/8" shell. The mill was down for many hours until the groove was filled with a reinforcing weld.

Rotary Kilns

The drive, riding rings and support rollers are the mechanical elements of the kiln that require the greatest maintenance. The mesh of the main gear and pinion should be checked every day to be sure there is sufficient clearance so a pinion tooth will not bottom on the gear resulting in fracture of the pinion tooth. The pinion and gear should have good bearing across the face. The bearing stands for the pinion should be rigid and well anchored to the foundation. Weaving, loose bearing pedestals will soon cause a pinion shaft failure because of the high bending stresses imposed on the rigid shaft.

The Texrope pulleys should be lined accurately and protected from dust by an adequate guard. The belt tension should be checked periodically and the motor adjusted if necessary. The motor should be cleared of dust periodically also.

Because of the high ambient temperature and high contact pressures, the lubrication of the main gear and pinion is very critical. There are available today, many

excellent gear compounds having high film strength, good stability, adhesiveness, good viscosity, characteristics with temperature variation and good oxidation resistance. These gear compounds are far superior to the asphalt base lubricants which have been generally used for this application.

The speed reducer gears should be inspected for gear pitting, corrosion or spalling. If this occurs and the reducer is not overloaded, a change in lubricant may correct the trouble. High-grade very stable oils should be used in the reducer because of the high temperature and heavy loading. Cheap lubricants will sludge up quickly and plug up lubricant passages inside the reducer.

The chain system now generally used in long kilns can be very seriously damaged if certain precautions are not taken. In cement kilns the moisture content at the exit from the chain system should be between one and five per cent. For lime sludge kilns, it should be between 10 and 15 per cent. Gases entering the chain system will burn up the chains if the slurry or sludge is too dry.

The trouble is usually caused when the kiln is shut down with the exhaust fan still operating. Hot oxidizing gases will then soon burn up the chain system. The remedy is to stop the exhaust fan at the same time the kiln fire is shut off and slurry feed is shut off. The CO₂ gas still being formed will actually prevent serious oxidation of the chains. Sample holes in the kiln shell will provide for the necessary moisture content checks.

The formation of mud rings or dams is a trouble maker but this is a lengthy subject and cannot be covered here. See the remarks in W. H. Tock's paper on "Operation and Maintenance of Lime Sludge Kilns".¹

The refractory brick lining in the kiln should be inspected periodically and replaced before it is too thin. A hot spot can ruin the alignment of kiln and cannot be remedied correctly. This warping of the kiln shell can cause trouble with riding rings, rollers and the drive as well as the lining. The kiln shell

¹ Procurable from Allis-Chalmers Mfg. Co., Processing Machinery Dept., Milwaukee 1, Wisconsin.

should have an adequate number of steel stiffener rings to keep the shell round. These should be about 2" thick and 8" deep.

The contact between the rollers and the riding rings should be regularly watched. Contact stresses between these parts are very high and good bearing across the face is imperative. Kiln piers supporting the load at the riding rings are very heavy masses and unless they are supported on rocks, some settling will take place destroying the alignment of the kiln and rollers. This can be checked if bench marks are established away from the kiln foundation. The carrying mechanisms should be relocated if settling of the foundation has caused misalignment.

It is preferable to line all the rollers with shafts exactly parallel to the kiln shell, and then to "cut" all the rollers a very slight amount so the thrust riding ring barely leaves the downhill thrust roller during part of a revolution. The cutting of the rollers must be done with extreme care. The adjusting screws can be used as micrometers. The screws should all be turned the same amount to insure all rollers having the same cut.

The bearing across the face of the tire can be checked by running 1/8" diameter lead wire between the tire and the roller. Heavy bearing areas will flatten the wire out more than the lighter pressure areas.

Records can be maintained of the thickness of these wires about every 2 to 3 inches along the length. It is good practice to make a rack to keep these wires as they quickly show what is happening to the bearing. The wires should be properly tagged giving date, number of the tire and the roller and the end of the wire identified to show which is the uphill and downhill end.

The thrust rollers on our kilns are designed to take full downhill thrust of the kiln due to its slope with all rollers parallel to the kiln centerline. This arrangement will give the longest tire and roller life. To be sure that there is no downhill cut on the rollers, they should be adjusted as mentioned previously.

Coolers

The greatest trouble occurs with

coolers when they are operated above temperatures for which they are designed. This holds for Air Quenching shaking type coolers or the rotary type. Excessive loads of hot material will buckle grate liners and shells. Recuperative type coolers should be operated with first thought that the machine is a cooler and the heated secondary air available for combustion is a by-product. Too many coolers require excessive maintenance because of the attempt to increase combustion efficiency in the kiln, sacrificing the cooler to obtain it. It is a question of economics and the slightly higher efficiency obtained from excessive cooler air temperatures in the writer's opinion would not compensate for the expensive maintenance

in the cooler. Dampers and baffles in the cooler, and the conveying rate of the material should be adjusted to conform with sensible maintenance practice.

Excellent suggestions on the care of electric motors, generators and centrifugal pumps are given in *Allis-Chalmers* publication 51X6229A and O5R7417A.

In closing, the old proverb "A stitch in time saves nine" applies to Processing Machinery as well as to your wife's sewing room.

The best way to assure that the stitch will be taken in time is to provide maintenance records—simple records, but complete in what has happened, what was done and what should be done to avoid further difficulty.

Maintenance at Kingsport Press

(Continued from page 58)

takes action. What he finds to do in such a situation cannot be planned in advance except in a general way. He has had an emergency organization representing different parts of the plant, with certain persons designated to back up this organization in action.

At present he is rebuilding the crew to make it more effective. The organization will be larger, with a section chief in each large part of the plant. Others will be named to back up these section chiefs. Spec-

ific duties will be assigned. All section groups, and the central group around Mr. Crosley, will be trained to handle the general requirements of any major emergency.

Kingsport Press has in its system a highly efficient maintenance organization, giving each of its three divisions an operations area, yet maintaining pressure on these departments through their responsibility to keep the plant going at top efficiency. This brings about intimate cooperation, along with complete separation.



Rockwell Manufacturing Company's new plant in Tupelo, Mississippi.

New Plant for Tupelo

This one-story, 150,000 sq ft plant of the ROCKWELL MANUFACTURING COMPANY is nearing completion in TUPELO, MISSISSIPPI. Rockwell, with headquarters in Pittsburgh, Penna., builds a wide variety of products in-

cluding valves, gas meters and regulators, water meters, taxi meters, cash registers and power tools. Some of these products will be fabricated in the new plant and it will also be used as a Southern service depot.

Power Distribution

textile mill system design and its modernization

By **R. B. WICKHAM**

Supt., Service Division
West Point Mfg. Co., Langdale, Alabama

LITTLE attention was paid to many of the factors that we now know enter into a properly designed power distribution system during the early days of textile mill electrification, and I suspect that what we had at West Point Manufacturing Company was typical at that time.

Our system is made up of approximately 15 miles of 12,000 volt transmission lines supplying 15 metered units. Five of the units are Cotton Mills, ranging in size from 15,000 spindles to 90,000 spindles. The other units served are the Company Villages and smaller divisions of the Company.

The peak today is approximately 27,540 kva, as compared with 17,000 kva in 1940—an increase of 50 per cent in about 10 years. At the plants, we have 12,000 volt to 600 volt step-down transformers. Energy is purchased from the Alabama Power Company at a metering point near our system load center.

Critical analysis of our system with the view of long range improvement and modification was undertaken in 1940. But, today as we look back over our ideas of 1940 we readily see how great has been the improvement in design of electrical distribution during the past 12 years.

THIS description of the electric power distribution system and its modernization is abstracted from Mr. Wickham's paper describing procedures at one of the South's largest textile operations.

The original paper was presented at a conference on electrical applications for the textile industry conducted jointly by the Textile Sub-Committee of American Institute of Electrical Engineers, and the A. French Textile School of Georgia Institute of Technology, held at Georgia Institute of Technology in Atlanta, Georgia.

As a result of our review of 1940, we came to the conclusion that there were many objectionable features which could be eliminated or improved upon. Subjects that received detailed consideration are tabulated.

To satisfactorily solve these problems and plan insofar as possible to meet future needs we needed to know many things and had to make predictions as best we could. Among the questions for which we had to set down answers were: Where to expect increases in plant loads; would changes in machinery design change the power requirement per foot of floor space; how to best use the valuable life that remained in existing electrical apparatus.

It is always fairly easy to determine the defects and shortcomings of an existing system, but when you start planning a new system—to be safe, dependable, flexible, and reasonable in cost—the problems really begin to multiply.

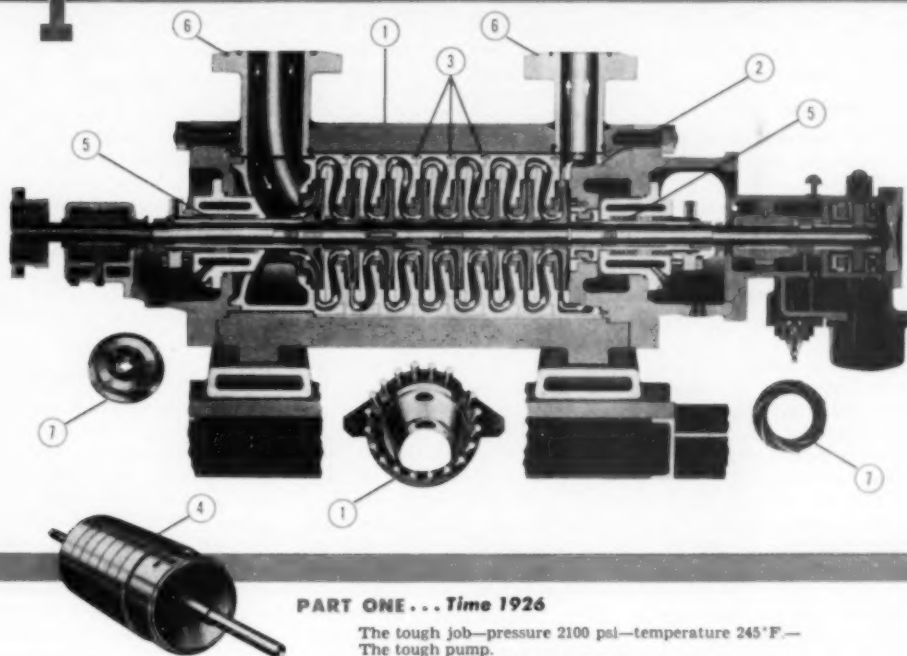
Management and engineers were cooperative in laying plans, and all

Items Receiving Detailed Consideration

- A. Safety for employees.
- B. Large quantities of bare copper, dangerous to employees, and also risk of accidental contact by some object.
- C. Fire hazard caused by presence of hundreds of gallons of insulating oil, highly inflammable, used in the transformers and oil circuit breakers.
- D. Practice of grouping transformers, oil breakers, and other electrical apparatus—thereby endangering the entire group of equipment in case of fire or serious electrical arc.
- E. Oil breakers were no longer considered reliable, and maintenance was a problem.
- F. Problem of housekeeping because of oil, lint and dust.
- G. Need to reduce the voltage spread, and the importance of energy loss in the long secondary circuits.
- H. Variation in size of transformers and other devices made it difficult to plan and maintain spare parts.
- I. Increasing extent of interruption of electrical service for maintenance.
- J. Increasing materials and labor costs have resulted in more rigid requirements by insurance companies.

THE STORY OF TOUGH PUMPS FOR TOUGH JOBS

BY **Pacific** PUMPS, INC.



PART ONE... Time 1926

The tough job—pressure 2100 psi—temperature 245°F.—
The tough pump.

- (1) One-piece cylindrical cast steel case.
- (2) Ring Type pressure joints.
- (3) Internal joints—metal-to-metal—no bolting.
- (4) Unitized internal assembly—assembled outside case.
- (5) Suction Pressure on both Stuffing Boxes.
- (6) Suction and Discharge Nozzles on Heads.

PART TWO... Time 1927

The job gets tougher—temperatures rise to 850°F.—
The pump gets tougher.

- (1) Cylindrical Case made from Steel Forging.
- (7) Impellers, Diffusers and other parts of unitized assembly made from Chrome Alloy Steel.

PART THREE... Time 1931-1951

Refining a tough—without loss of toughness.

1931—(6) Suction and Discharge Nozzles made integral with case.
1932—(1) Line bore of case with Chrome Alloy by Fusion Welding.
1933-1951—Mechanical, hydraulic and metallurgical research and experience make a refined "Pacific Tough" available for the "Toughest Job".

For Details—Bulletins 106 and 109

Pacific Pumps inc.

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York Offices in All Principal Cities



of us knew that none of us were prophets or too good at interpreting the crystal ball.

Our plant buildings at that time were already full of machinery, and as we looked at the long range planning, we could see no further plant building additions, and certainly none of us foresaw the 100 per cent increase in power demand which has occurred in the years between 1940 and 1951. In this period, while the power demand was increasing 100 per cent, the floor space in our plants has been enlarged only 10 per cent.

Program

We realized the need for all the help we could get, so we called upon our friends.

A. The Alabama Power Company was asked for their experience and advice in preparing plans.

B. The electrical equipment manufacturers furnished their forecast of new equipment developments.

C. The insurance companies gave their views and helped us benefit from their vast experience.

D. And, of course, management helped in every possible manner by helping keep the financial program in line—and yet allot necessary finances for a really constructive improvement program — year by year, and month by month as needed.

We worked with the engineers of Alabama Power Company and made use of a calculating board operated by one of the electrical manufacturing companies. With this equipment we set up our system in miniature and assumed cases, and investigated the various components that have to be known in order to plan a safe, dependable, and flexible power system.

I soon learned that the electrical engineers with whom I was working never ceased to talk about the importance of interrupting current values. Let me say this—if you have ever had an occasion to see the results of what can happen when an oil breaker with inadequate interrupting capacity is called upon to clear a short circuit, when the available energy has a value of 150,000 to 200,000 kva, you will never forget such an experience. This is not intended to

frighten you—only to advise you to take a good look at what you have.

After securing the available short circuit kva on the 12,000 volt system, it was then easy to determine the short circuit current on the 600 volt distribution system by merely considering the size of the transformer banks and the motor load connected to each bank. Voltages and power factor were also closely studied.

The next step was to decide upon transformer sizes, and whether to use single phase or three phase units, along with the merits of oil and Askerel insulation. In our case, we decided against using air cooled units for the 12,000 volt transmission, but we are sure there are also applications for these units. The interrupting capacity of the 600 volt breakers was determined from the transformer ratings and the central station conditions such as primary voltages and station transformer sizes. Then the question of oil circuit breakers as compared with air breakers needed to be answered.

As our next step, we went into the study of system cost. In our case, this investigation included 12,000 volt transmission, transformation, protective devices, breakers and control equipment—in fact, all components from the central station to the motor.

Other factors which we considered were: energy losses, voltage spread, value of space for transformers and circuits, cost of normal maintenance, cost of replacement in case of failure of units or parts, production loss either for maintenance or repairs, safety to employees, and spare units and parts.

Another important factor which we had to consider was that the 1940 equipment, with normal maintenance, was capable of continuing to give service in our long range planning. Therefore, consideration was given to a scheme calling for a piece-meal change, rather than the complete replacement of existing units at any one time. Also it was important that the change-over be made without loss of production and with a minimum of overtime costs.

We decided that it would be

practical to classify the electrical equipment according to hazard and remaining life of units, and it was our opinion that the old 600 volt breakers, because of fire hazard and risk of failure due to low interrupting capacity, should be the first to be replaced.

After studying all our accumulated data, we decided to standardize on 1000 kva unit type substations, Askerel filled.

Many factors were considered in reaching this decision, some of the most important being:

1st—Cost

Examination of the cost versus capacity curve indicated that the per kva cost of the 1000 kva unit was near the minimum. Also the cost of the air circuit breakers was an important consideration because we found we could use the 25,000 kva interrupting capacity breaker to give us what we wanted in capacity and at satisfactory cost.

2nd—Size and Weight

Physical dimensions of the 1000 kva units were also very important, for in our case a desirable location in the plant yard is a serious problem. The small size, together with the non-flammable nature of the insulating medium, enabled us to place these units within a few feet of the mill wall—thus keeping feeder lengths and feeder investment at a minimum.

The 1000 kva transformer section weighs about 15,000 pounds, and the switchgear section probably less than one-half of the transformer section.

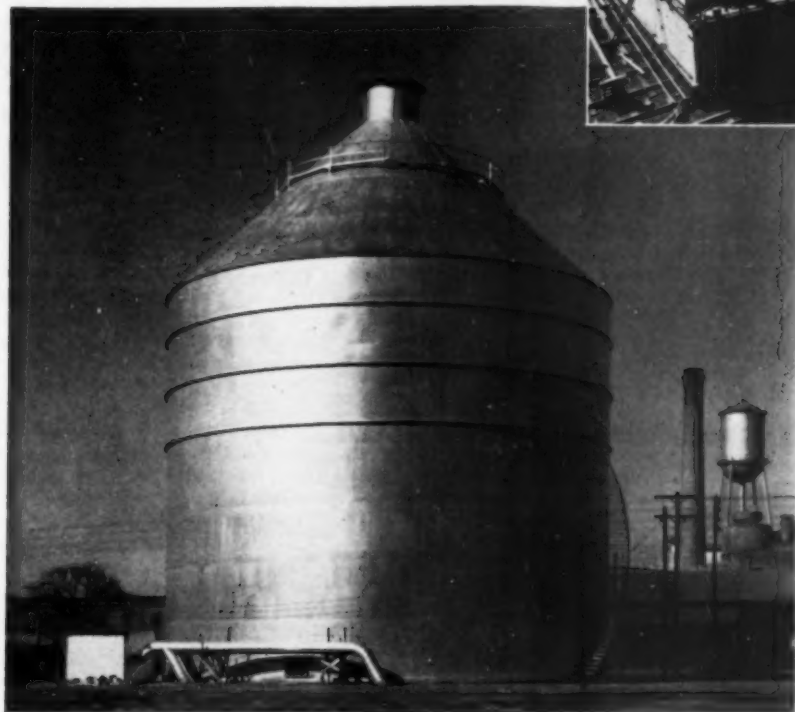
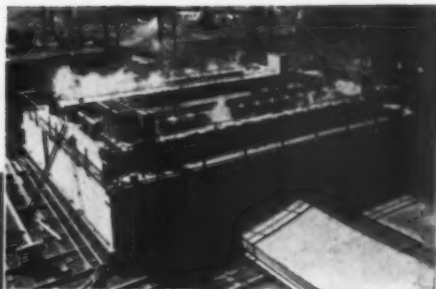
3rd—Ease of Installation

Since these units are factory assembled, the only field work is to bolt the switchgear section to the transformer section, connect the high and low voltage lines, and the unit is ready for operation.

4th—Capacity

This particular size seemed also to fit our local plant load conditions, as this rating could be reasonably loaded without extending the secondary an uneconomical distance. Also, in case of an interruption, only minimum practical amount of load is affected.

LONGER TANK LIFE
starts here..



**STEEL TREATED BY
PHOSCOTE PROCESS
MEANS
NEW ECONOMIES**

STEEL PLATES for the Farmers Cotton Oil Company plant's cottonseed and soybean tank at Wilson, North Carolina, were assured a longer, more useful life by the Phoscote Process of pickling and painting.

Here is an efficient, economical method of removing mill scale from steel and providing the cleaned surfaces with a coating that greatly improves the bond between steel and paint.

The Phoscote Process consists of dipping steel plates or shapes successively into three vats. The first contains a hot dilute sulphuric acid solution which descales the steel—the second is filled with rinse water—and the third contains a hot dilute phosphoric acid solution. Then, while the steel is still warm, a coat of paint is applied to protect the cleaned surface.

When ordering Horton tanks or steel plate work, specify the Phoscote Process. The coming years will prove your good judgment.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3.....2180 Healey Bldg.
Birmingham 1.....1531 North Fifth St.
Boston 10.....1044—201 Devonshire St.
Chicago 4.....2107 McCormick Bldg.
Cleveland 15.....2218 Guildhall Bldg.
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

Detroit 26.....1534 Lafayette Bldg.
Houston 2.....2132 National Standard Bldg.
Los Angeles 17.....1545 General Petroleum Bldg.
New York 6.....3312—165 Broadway Bldg.
Philadelphia 3.....1646—1700 Walnut St. Bldg.

Salt Lake City 4.....848 West 17th South St.
San Francisco 4.....1531—200 Bush St.
Seattle 1.....1345 Henry Bldg.
Tulsa 3.....1628 Hunt Bldg.
Washington 6, D. C.....1114 Corliss Bldg.
In Canada—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

5th—Maintenance

By standardizing on one particular rating for all our plants it is practical to keep a complete spare station that can be placed in service at any time to replace damage. Also, spare 600 volt circuit breakers can be carried in stock, and if necessary the breaker in trouble can be replaced in a matter of minutes.

Except as modified by other factors, such as value of space for other uses, these station sites are located at or near the center of the load area they serve.

The handling of the transformer or switchgear unit can be done with the usual 15 ton winch and derrick equipment commonly used on line trucks.

One of the desirable features of

the station is the coil winding overload protection. In our case, at 70 C winding temperature the radiator cooling fans are started; at 90 degrees an alarm sounds, and at 110 degrees the trip coil operates. With cooling fans, the 1000 kva unit will carry about 20 per cent overload.

Our feeder air circuit breakers are rated at 400 amp trip, 600 amp frame, 600 volt, 25,000 amp interrupting rating. They are three pole, draw out type, with over current protection and instantaneous short circuit trip. These draw out type air breakers are removable for quick change in case of trouble.

It is our practice to maintain as great a clearance above ground and over objects as practical. Even though the cables are insulated and tied directly to ground messenger

cable, there is always the possibility of accidental contact which may result in an injury.

As part of our report to management, we forecast future loads based on history of past growth, and I used this curve as argument for more units as needed. Each year we held a conference with management, and as always this report came out to reinforce my idea for more units.

We have not completely removed from service any of the old transformer units as yet; however, load has been greatly reduced on all of the old transformers.

In 1940 there were in service more than 100 oil circuit breakers, and all but five are now protected with air circuit breakers. We do still have some air breakers that do not have adequate interrupting capacity.

Summary

To me the ideal power system would be one which supplies absolute reliability, flexibility, proper voltage and maximum safety.

While this ideal system can probably never be attained, each of these goals deserves careful attention if we are to approach the ideal as nearly as economically feasible.

In planning for reliability, we consider the value of production and employee earnings the two most important factors.

By flexibility, I think of a system that can be adapted to suit load conditions and changes as they occur, with a minimum of expense and effort, while maintaining maximum production.

The maintenance of rated voltage at the equipment is, of course, a very desirable goal. We find that the maintenance of a high system power factor, besides usually saving us money on our power bill, improves the voltage regulation of all components of the system. In our case, the power factor at the plants approaches unity and is 94.5 per cent for the entire system.

Another benefit is to operate all main feeders at the highest secondary voltage, and in our case 600 volts, and use dry type transformers "on the spot" for lower voltage requirements.

Collapsible . . returnable . . reusable

THE new 55 gallon synthetic rubber-fabric drum of U. S. Rubber Company should effect sizable savings in return shipping costs, since more than 2500 collapsed drums can be shipped in a standard railroad box car that would hold only 300 rigid drums.

An empty 55 gallon synthetic rubber-fabric drum weighs less than 30

lb. No venting is required while being filled or emptied, eliminating hazards in handling certain acids and liquid combustibles.

Experimental tests indicate that the new drum will be suitable for the shipment of oils, greases, fats, acids, paints, emulsions, soaps, dry powders and a variety of pharmaceutical and industrial chemicals.

U. S. Rubber's new 55 gallon shipping drum for liquids is easy to empty. It can be collapsed after emptying, is returnable and reusable. No vent is needed to fill a collapsed drum.





makes mincemeat out of old production schedule

Thirty minutes per batch was the time schedule on mincemeat cookers at this eastern food plant... but that was **before** they replaced old-type traps with Yarway Impulse Steam Traps.

Now it's 15 minutes—one-half the time—and the plant superintendent is so enthusiastic over the production increase that he is personally spreading the news about Yarways to other plants.

A good record? Yes—but not unusual for Yarway. Yarway traps are designed to increase production—by sending the most premium B.T.U.'s at top temperatures into your process or product. **They get equipment hotter, sooner... and keep it hot.**

Small size, easy installation, good for all pressures, dependable operation, low maintenance and low cost are other reasons why over 750,000 Yarway Impulse Steam Traps have already been installed in plants everywhere.

It's easy to buy Yarways... 216 industrial distributors stock and sell them. One is located near you.

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NEW TRAP SELECTOR—New 20-page book tells you the right steam trap for any specific application. Write for your free copy.



the steam trap designed
with production in mind

Steel Strapping Methods for Bracing Carload Shipments

One of the best opportunities for industry to make quick and substantial savings is through adoption of improved methods of packing, handling and transporting the plant product.

Q—What is meant by the "floating load" method for bracing carload shipments?

A—Items stowed in each end of a railroad car are securely bound with steel strapping to form one single package or unit. The load becomes an independent mass unit of weight, free to shift on the car floor under impact. Degree of movement is governed by the amount of friction between the unit and the surface of the floor.

Q—What is the so-called "controlled floating load"?

A—One which is snubbed in some manner to restrict excessive lengthwise movement of the strapped units. This is sometimes called a "controlled unit load."

Q—What is an "anchored load"?

A—One in which steel strapping is secured to the car side walls, or side walls and floors, by anchor plates, to hold the load in a fixed position.

Q—When more than two sets of anchored bands are used in one end of the car, why should the anchors be staggered on the car walls?

A—Staggering distributes the impact shocks at the points of anchorage over a greater number of car wall posts or studs in the car frame.

Q—If the car bracing straps are loose at destination, does this mean that they have stretched?

A—No. It indicates a greater compression of the lading caused by transportation shocks. This often means that products were not properly and tightly stowed in the car prior to bracing.

Q—Are freight rates of any value in determining the bracing method to be used?

A—Bracing carload shipments with steel strapping and thin dunnage can often save hundreds of

pounds of dunnage on which freight must be paid.

Q—What is dunnage?

A—Dunnage refers to any material used to brace products in or on a car.

Q—Name some of the advantages and disadvantages of the various types of bracing methods.

A—In a solid load, or through load, the total cumulative shock of any coupling impact must be absorbed by the containers which contact the struck end of the car.

In a divided load, which is rigidly wood braced, one half of the total shock is absorbed by the containers which contact the struck end of the car. The other half of the shock is absorbed by the containers contacting the bulkhead, or gate, which confines the lading in the opposite end of the car. This is predicated on an equivalent load weight in each end of the car. Also keep in mind that any load tends to move toward the struck end of the car.

In an "anchored load" the shock absorbed by the containers at the struck end of the car is the same as in a divided load. Since the steel strapping confining the lading in the opposite end of the car is resilient, it absorbs much of the shock to the lading in that end of the car. This reduces the amount of shock to the containers. A "floating load" is free to shift and come to a sliding stop. Repeated

These questions and answers were presented at a round table discussion "Developing the Unit Load" at a meeting of the Midwest Materials Handling Society.

Presiding over the panel was **John G. Bucuss**, General Manager, Strapping Division of Acme Steel Company, and recently elected President of the Materials Handling Institute. Panel consisted of **A. N. Perry**, Signode Steel Strapping Company; **E. W. Bonekamp**, Brainerd Steel Company; **H. M. Reed**, Gerrard Steel Strapping; **G. E. O'Brien**, The Stanley Works, and **E. C. Evans**, Acme Steel Company.

Check pages 62-66 in the July issue of SP&I for the initial series of these questions and answers covering unitizing by bundling and on skids or pallets.

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You get at least 80% guaranteed thermal efficiency for the life of the unit . . . no matter which fuel is used. There's no compromise . . . no sacrifice of efficiency that often results when one burner is used for both fuels. Changeover from oil to gas, or vice versa, takes less than 20 minutes.

For overall economy, read about Preferred's distinctive 25-year features in the panel at right. Full details in Bulletin 1000. Write for your copy today.

Each distinctive feature of the Preferred Unit Steam Generator is designed to give efficient, economical service for an average of 25 years with proper care and maintenance. You benefit by better performance . . . longer life . . . lower boiler costs.

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3. Staggered tube construction - minimizes possibility of tube pitting, even at low firing rates.
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FD-300

tests have proved that at least 50 per cent of the shock is dissipated by the sliding friction of a "floating load." They are "riding with the punch."

Q—What effects will a rough riding car have on the various methods of bracing?

A—A rough riding car causes the lading to oscillate. The severity of the oscillation depends upon train speed, track, wheel and spring conditions. Under some conditions the vertical oscillation is sufficient to bounce the lading clear of the car floor. This condition tends to loosen any wood bracing.

Q—At the moment of a coupling impact, how does the center of the car react?

A—Tests made by carriers and strap manufacturers indicate that a severe upward vertical shock occurs as a result of end impacts. The intensity varies between 40 to 60 per cent of the amount of the longitudinal shock.

Q—What effect does this have on the bracing?

A—The destructive tendencies are the same as in a rough riding car, but of a greater magnitude. However, these shocks have no material effect on the bracing if the lading is braced according to the "floating load" principle.

Q—How can tilt be prevented in "floating loads"?

A—Tilt can be prevented by the use of diagonal strapping. The straps crossing the top and bottom of the front and rear gates must be in a horizontal plane. However, these straps cross each other along the sides of the units. The top strap of the front gate is the bottom strap at the rear gate.

Q—Which is preferred: a high floating load with a maximum amount of clear floor area, or a low floating load with a minimum amount of clear floor area?

A—Usually, container strength and circumstances permitting, a high load is preferred if it provides more room in which to shift.

Q—Are there any devices available to restrict shifting of "floating loads"?

A—Yes. Mechanical snubbers which engage the strap, metal retarders, anti-skid plates and other steel devices are available from strapping manufacturers.

Q—Does shift mean there will be damage to the lading?

A—Definitely not. Before the "floating load" principle, splintered bracing damaged the lading whenever the load shifted. Shift became associated with damage as synonymous. However, shift in a properly strapped load usually means damage free arrival.

Q—Why are guide rails required for loads of various products?

A—There are two reasons for guide rails:

(a) To comply with Railroad safety rules, when the loads are not of sufficient width; and

(b) To keep the units in alignment, and to prevent spreading of the units.

Q—Why are gates specified for loads of barrels, drums, etc., which are braced with steel strapping?

A—Rigid crosswise members at the front and rear of each unit serve several purposes, some of which are:

(a) To provide better bearing for straps against containers;

(b) To hold the load in better alignment; and

(c) To prevent dislocation of strapping.

Q—Are divisional gates necessary in a "floating load"?

A—They are necessary only when it is desirable to separate various types of containers.

Q—Can a "floating load" be placed on top of a solid floor load?

A—Yes, if the top of the floor layer is sufficiently level for the "floating load," or if a false deck is provided.

Q—Why do the strapping manufacturers suggest that anchors be placed at least three feet behind the face of the unit?

A—This takes advantage of the greater shock absorbing qualities of longer strands of steel strapping and avoids angular pull-away from the point of anchorage.

Q—How can anchors be easily removed from car walls?

A—Tools are obtainable from strapping manufacturers to remove anchor plates from car walls and floors.

Q—How long has steel strapping been used as a method of bracing carload freight?

A—Steel strapping has been in use more than 25 years to brace carload shipments.

Q—Do the railroads approve the use of steel strapping for bracing carload shipments of various products?

A—Yes. Many detailed applications are set forth in the various loading rules.

Q—When making stop-over shipments in railroad cars, should each consignment be independently braced?

A—To provide maximum protection, the shipper should brace the lading adequately for each consignee, without depending upon the consignees to re-brace for subsequent stops.

Q—If the front of the load does not come evenly across the car width, what can be done to prevent looseness within the load?

A—Any irregularity developing in the face of the load due to different container sizes should be filled in with adequate blocking material or fillers. This affords complete bearing of gates to load and eliminates undue pressure being applied against any of the containers immediately adjacent to the gate.

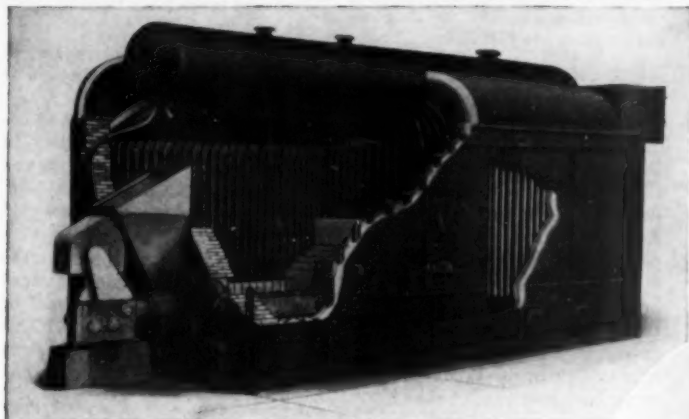
Q—Can steel strapping be successfully used to prevent loaded fibre containers from falling into void spaces created at the ends of solid loads?

A—Yes. This can be done by using fibre corner troughs at the horizontal edges of a small unit in each end of the car. This unit should be confined with four steel straps applied in a vertical plane.

Q—Can steel strapping be used to prevent side shift of containers in the doorway area?

A—Steel strapping tensioned between door posts with or with-

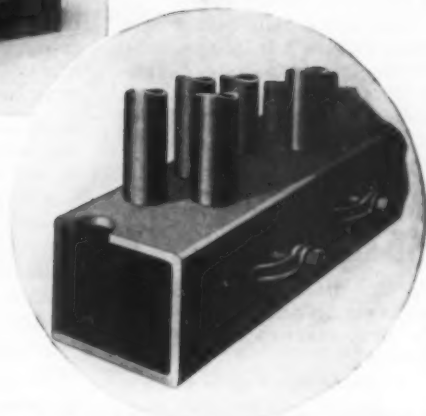
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BACKED by a long experience gained in the manufacture of over 500,000 H.P. of Erie City 2-drum water tube boilers and of thousands of complete built-up boiler units, Erie City has incorporated side wall water cooling as an integral part of a low headroom 2-drum boiler. Outstanding of many features, is the method of obtaining a ring flow circulation, in each side wall element. A downcomer tube is provided for each pair of radiant (riser) tubes in the side wall, which, with two front wall downcomers assure an ample supply of clean circulating water in the water walls at all times. Insulation between riser and downcomer tubes keeps water at lower temperature in the downcomers while heat is rapidly removed from refractory through risers. Write for VL bulletin that clearly describes and illustrates this and many other features.



Water Wall tube arrangement—1 Downcomer for each 2 Riser Tubes



Shop assembled and shipped as a unit in sizes to 300 H. P.

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Complete Steam Generators • Type C 3-Drum Boilers • Types VL & VC 2-Drum Boilers
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Steel Heating Boilers • "Keystone" Packaged Steam Generators • Coal Pulverizers
• Underfeed and Spreader Stokers • Welded Pressure Vessels for the Process Industries.

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out fibre backup sheets is a highly rated method for retaining products in position in the doorway area.

Q—What are the standard dimensions of box, refrigerator, flat and gondola cars?

A—Box cars are made with inside widths which vary from 8 ft 6 in. to 9 ft 6 in. Lengths are usually 40 ft 6 in. or 50 ft 6 in. The present trend is toward the 9 ft 2 in. x 40 ft 6 in. car with a 10 ft clearance height. Refrigerator cars vary from 8 ft 2 3/4 in. to 8 ft 10 in. in width and 33 ft 2 3/4 in. to 42 ft 6 in. in length. Height varies from 6 ft 11 in. to 7 ft 7 1/2 in.

Flat cars usually have a minimum width of 9 ft between inside faces of stake pockets. Lengths may vary from 42 ft up to 60 ft. Gondola cars usually have a minimum of 9 ft inside width and will vary from about 40 ft up to 60 ft.

Specific information for any particular car may be secured from any current Railway Equipment Register.

Q—Can "floating loads" be made when various products are shipped in many different types of containers?

A—Yes, without undue difficulty.

Q—Where should high density items be stowed in a "floating load"?

A—They should be stowed in the floor layer, at approximately the center of the unit.

Q—Does the previous answer hold true for "anchored loads"?

A—Yes, unless the items are individually anchored to the car walls.

Q—Is the "floating load" an acceptable method for bracing acid, shipped in carboys?

A—It has not been recognized in the "Rules Governing the Bracing and Shipping of High Explosives and other Dangerous Articles," yet the "floating load" method has been in constant use in the Chicago area for 25 years.

Q—Is the "floating load" method acceptable for products shipped on flat or gondola cars?

A—Yes. Carloads of creosoted

poles, piling, lumber, rails, steel pipe and related items are usually all "floating loads." The "floating load" method is permitted for many commodities shipped on open top equipment so long as safety rules are fulfilled.

Q—Are there any rules to be followed when making shipments in railroad cars?

A—Yes. The "Rules Governing the Shipping of Commodities on Open Top Cars," issued by the Association of American Railroads, provide minimum and mandatory requirements.

The "Rules Governing the Shipping of Commodities in Closed Cars" are recommended except for safety regulations on a few specific commodities, as a result of experience over the years.

Q—What are some of the commodities whose shipping are governed by mandatory rules?

A—(a) All commodities shipped on open top cars.

(b) High explosives and other dangerous articles.

(c) Fruits and vegetables, according to the tariff.

(d) Some vitreous clay products.

Q—What procedure should be followed for shipping an item that is not listed in the rules book?

A—Follow the same general bracing pattern as specified in the rule book for a similar item. Ask for the advice and assistance of the local RR Inspector and the representative of your strapping supplier.

If there will be a considerable movement of the items in question, "Shippers must procure authority from the Secretary, Mechanical Division, Association of American Railroads, or the Chairman, Committee on Loading Rules, to make such experimental shipments."

Fourteen drawings of the proposed loading and bracing method must accompany requests for authority, together with the names of the railroads serving the shipper.

Q—Will car bracing by steel strapping compensate for poor stowage?

A—No bracing system will have

a chance of success if the lading has not been properly stowed.

Q—Can cylindrical items, long in comparison to their diameter, be packaged to simplify carload stowage and bracing?

A—Yes. Carbon electrodes up to 18-in. in diameter and about 6 ft long are a prime example.

The most successful method developed is the unitized method, in which the electrodes are stowed on their sides in pyramid fashion, and securely strapped to two skid runners.

The skid loads are placed in the car and the entire load is braced under either the "floating load" or "controlled load" method. This method was widely publicized by one of the larger shippers.

Q—How can skid loads of merchandise be braced for safe transit if the containers do not have sufficient vertical strength to withstand the shocks of a second deck?

A—Many containers will not withstand concentrated loads. False decking will distribute the pressure and reduce the potential damage.

Q—How can the second deck, in loads of refrigerators and stoves, be prevented from side shifting?

A—Short lengths of heavy punched car bracing strap, crossed over each other and nailed into crates in adjacent rows and layers usually eliminate side shift. When tall and narrow products are involved it may be necessary to nail short pieces of strapping to the tops of adjacent cases in the second layer.

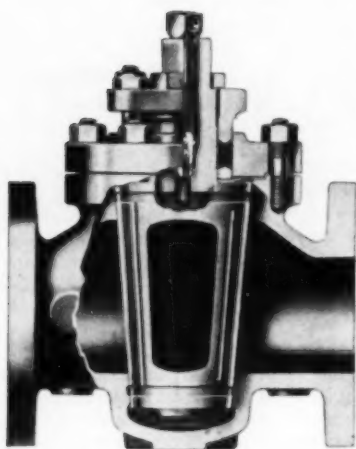
Q—What is presently considered the best method of bracing large rolls of paper which are stowed on their sides?

A—Stow the rolls in units of five, three rolls in the floor layer and two in the second layer, securely strapping each unit. This gives consistent roll to roll contact. In shipments of seven to nine rolls, an interlaced steel strap should be used to encircle five of the inner rolls in the unit. This is in addition to the other steel straps.

*(Steel Strapping Methods
Continued on page 125)*

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For handling petroleum products, natural or manufactured gas, acids, alkalis, solvents, slimes, slurries . . . in fact for almost any hard-to-handle liquids—there's a Walworth Lubricated Plug Valve designed for the job.

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Helping the MAN-IN-THE-PLANT

Trouble Lamp for M-G Set

OCCASIONALLY the small size of the plant or the physical layout of the electrical system make it uneconomical to employ a full-time switchboard or engine room attendant. We had this situation when an expansion program left the M-G set far removed from the new power room and boiler plant.

This set furnishes 250 volt d-c current for four bridge type cranes of various sizes but all of them important to the full scale production of the plant making bulk type fuel trucks and tanks. Having a ground detector on the M-G set panel was of but little help in catching a seri-

ous ground condition in time since it was checked but once a day by the maintenance electrician.

To improve on the situation the engineer placed a second ground detector of the two lamp and ground leg type on the crane in the line of vision of the crane operator.

In practice with no grounds present both lamps burn at half brilliance, but in a case of gradual insulation failure, one lamp dims and the other brightens. Any decrease in insulation values due to mechanical abrasion or infiltration of oil or water will eventually darken one lamp completely as the other in-

creases in brightness to full brilliance.

Accidental crosses between a conductor and ground lights up the corresponding lamp instantly yet gives the crane operator time to notify the engineer of an impending short circuit.—Paul C. Ziemke, Oak Ridge, Tenn.

Hot Bearing

MOTORS sometimes are required to operate in unbelievably hot locations. One motor in a metalworking plant is mounted vertically beneath a steel-annealing furnace to drive a blower that circulates the hot treating gases. The blower handles gases that are 1500 F. Only 14-in. away is the bearing of the motor, which obviously must not be allowed to overheat.

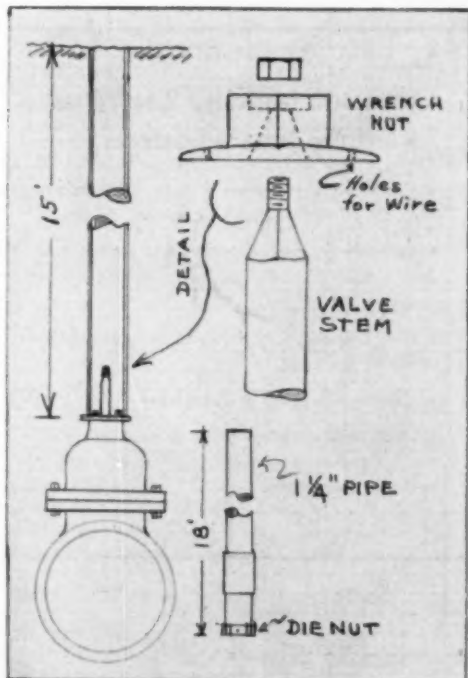
This was achieved—with a pre-lubricated sealed ball bearing—by using a shaft of chrome nickel steel, which has low thermal conductivity, and a heat exchanger to remove heat from the shaft, lowering the temperature at an effective rate of 100 F per inch. The result: a bearing that runs acceptably cool.

Planning and Rigging Save Digging

THE wrench nut came off the stem to an 18-in. underground water valve and we were therefore unable to turn the stem. The valve was buried about 15 ft and the only access to the valve stem was through a 6-in. pipe brought from the valve stem to the ground surface.

Investigation, by pumping out the 6-in. pipe and reflecting sunlight down on the stem with a mirror, showed that the nut was off and threads on the end of the stem were slightly battered. We found that by tying it to the end of the wrench with wires, the wrench nut could be put in place, but we were then unable to turn the stem because of the nut thrusting off of the stem.

To avoid digging the valve up, we brazed a 5/8-in. die nut onto the end of a piece of 1 1/4-in. pipe (see sketch) and rechased the threads on the end of the stem. Then we set the wrench nut in place with the wire rig and it remained only to devise a way to put the hold-down nut in place and tighten it. This was accomplished by replacing the die nut on the end of the 1 1/4-in. pipe with a standard socket wrench head—brazed in place. Then the hold-down nut was stuck in the socket wrench with soft paste and the assembly was made up by "remote control," using the 18 ft long 1 1/4-in. pipe as a socket wrench extension.—John C. Porter, power engineer, Rock Hill Printing & Finishing Co., Rock Hill, South Carolina.



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EQUIPMENT,**
*the BEST is not
too good for you*

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in design, workmanship,
and use of materials?**

The Complete Line includes valves
in Bronze, Iron, Steel and the
widest selection of Corrosion-
Resisting metals and alloys ever
made available to Industry.

*Quality fine
throughout
"The Line"*

Fig. 3003 W. E.—Class 300-pound Cast Steel
O. S. & Y. Gate Valve with welding ends for
Power Plant installations.



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Flame-Cutting Slotted Pipe

ASAN ANTONIO, TEXAS, iron works cut production time approximately 80 per cent by substituting flame-cutting for milling on a pipe-slotting contract. The cost of the work was also considerably reduced.

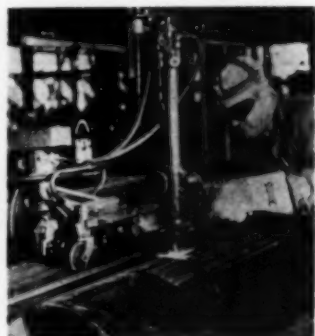
The job consisted of cutting approximately 3,000 slots, measuring 8-in. long by 5/16-in. wide, in 40 ft sections of 18-in. pipe. The pipe wall thickness was 3/4-in. It was to be used as well screen in an irrigation well of the City Water Works of Eagle Pass, Texas. The contractor was the Alamo Iron Works.

Milling was originally planned for the job, but it developed that

approximately 500 machine hours would be needed. Flame-cutting was then tried and adopted. A blowpipe with a special two-nozzle coupon cutting adaptor was mounted on an Oxweld cutting machine to cut both sides of each slot in one pass. In all, 2,700 linear feet of cutting was completed in 103 operator-hours. The oxygen con-

Operator starts a slot cut in pipe 18-in. in diameter, and 3/4-in. thick. A two-nozzle coupon cutting adaptor is attached to the blowpipe so that the 5/16-in. wide slot can be cut in one pass. An Oxweld portable cutting machine is being used to mechanize the job.

sumption was 1,380 cu ft, and the acetylene consumption was 200 cu ft. Frilled holes were used to start the cuts. Smooth, even cuts resulted that needed no finishing.



Unique Power Conversion

THE uncertainty of the coal supply forced serious study of the electrical power supply in our plant. The conversion from coal to gas in the Atomic Energy Commission plants released a block of electrical power that decided the issue for us. We abandoned our boiler and engine plant to buy Tennessee Valley Authority power at 2,300 volts.

With two generators of potential 300 hp size, when converted to operate as motors, we had the required size of prime movers for the line shafting, lacking only some switch gear in the form of two compensator type starters and a small motor generator set for supplying the excitation for field circuits.

Being aware of the starting torque limitations of the synchronous motors and having two 30 hp motors connected for 460 volts, we tried an interesting experiment that eventually paid off. A multiple V belt drive was used to couple these squirrel cage motors to each section of line shafting and these were used to bring the line up to required speed, just before whistle time. The synchronous motors, being fully accelerated previously as the shafting came up to speed by squirrel cage drive, then took over the load as the line machines went into production.

Obviously, there was no point to spinning the squirrel cage motors

needlessly during the production period with more than ample power available from the converted alternators, hence a manually operated clutch was installed at each motor. Still later, the same type, but larger clutches were installed between the synchronous motors and their respective line shafts to ease the starting drag on the squirrel cage units.

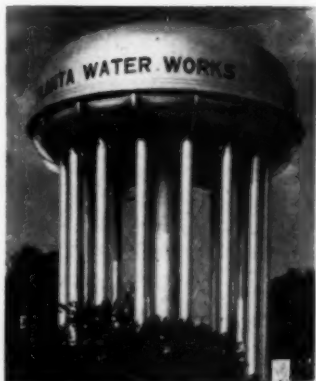
The new system is completely flexible from every operating angle and there is never a slackening of speed in production, even if every machine is in full operation the full eight hour period. The most commendable feature of the conversion program, besides the appreciable saving that accrued through freedom from new motor costs, was the almost immediate improvement in the power factor which had been very low when we generated our own power. The synchronous motors improve power factor so much that the switch board instrument reading is now in the unity range practically all the time. The below-unity periods being when much welding is done by a-c type machines and the auxiliary motor load of induction type proves to be a bit excessive for the size of the equipment.

The maintenance men are still laughing at the meter reader who came around for the first time after

the synchronous motors went in operation and insinuated that some one had tampered with the meter seal to get at the meter's calibration devices. When close inspection proved him wrong he thought a capacitor bank had been installed at the substation, or at the several load centers in smaller and more diversified manner. The synchronous motors are money makers.—
Paul C. Ziemke, Oak Ridge, Tenn.

Atlanta, Georgia, Adds Water Tank

THIS is the 2,000,000 gallon Horton radial-cone bottom, elevated water tank built by the Chicago Bridge & Iron Company for the City of Atlanta, Georgia.



Have you ever seen a flying 'dust' man?

*...Then ask a Buell Engineer
to determine the most efficient,
most economical method of
collecting nuisance dust
—for you*

When we're called upon to solve a fly-ash problem, Buell engineers plan with precision, yet move with surprising speed.

Quickly they can pin-point your major cause of escaping dust...analyze the dust as to particular characteristics...Then, with a sureness that comes only by experience, they will recommend, design and build the Dust Collection System that will most efficiently and economically do the job.

The result? Employee morale goes up. Plant-community relations reach new and more favorable levels.

Buell engineers—a highly skilled group of industrial "dust" men—are backed by more than 200 man-years of experience in the science of dust collection. For full information write today. Ask for the new, informative Buell 'Dust Collection' bulletin. Buell Engineering Co., Dept. 80-I, 70 Pine Street, New York 5, N. Y.



HIGH-EFFICIENCY CYCLONES • ELECTRIC PRECIPITATORS
TYPE 'LH' COLLECTORS • LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS • DUST HOPPER VALVES

buell

Buell van Tongeren Cyclones
take the guesswork out of
efficient fly-ash collection.



C. E. ROSENBERG A. R. P. S.

ENGINEERED EFFICIENCY IN DUST COLLECTION

NEW EQUIPMENT for Southern Industry

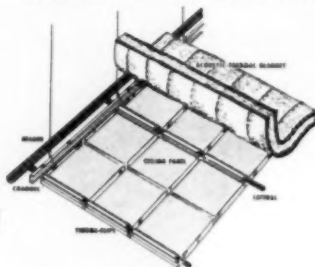
Industrial Ceiling

K-1 BURGESS-MANNING COMPANY, Architectural Products Division, 5970 Northwest Highway, Chicago, Ill., is producing a new type of ceiling which affords radiant heating and cooling, as well as acoustic control.

The new prefabricated development for remodeling or new construction can be used in plants and offices. The ceiling brings radiant heating from above and distributes it evenly to every part of the room. According to the manufacturer, it keeps the floor at room air temperature; is easily installed; affords maximum availability to services located behind the ceiling; and has a pleasing tile-like appearance.

The ceiling consists of perforated metal panels, which are heated by hot water and radiate heat into the room without heat shadows or convection drafts. Blankets of acoustical material above the heating units act as a thermal insulator and vapor barrier.

Blankets of acoustical material above the heating units act as a thermal insulator and vapor barrier.



Looking down on a Burgess-Manning Ceiling installation, showing construction and method of suspension.

Free additional information is available to readers of *Southern Power & Industry*. Check item number on the postage free service coupon post card—page 17.

This type of ceiling also provides air conditioning in the summer, with cold water circulating through the system and absorbing heat from the room.

Ceiling may be installed by local contractors, but the essential elements are prefabricated, and engineering service is provided by the manufacturer.

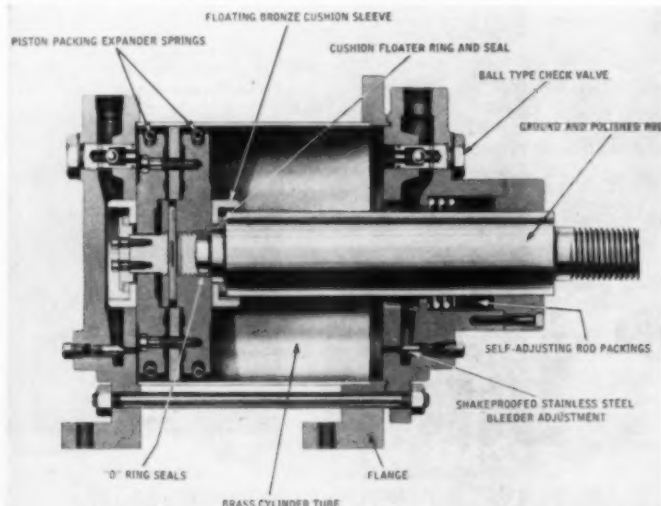
Low-Pressure Cylinder

K-2 HANNA ENGINEERING WORKS, Chicago, Illinois, announce their newest low-pressure cylinder design. Units are

designed for operation up to 110 psi, and, with minor modifications, for higher pressures depending on cylinder diameter and operating medium (air, oil or water).

Design features of the Hanna Engineering cylinders are: cork floator ring which facilitates cushion alignment with head and insures a seal during cushioning; spring-backed chevron

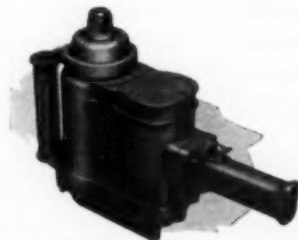
rod packings, which are self-adjusting for consistently correct compression; and flange design, which permits removal of front head without disturbing mounting.



Impact Tool

K-3 INGERSOLL-RAND COMPANY, 11 Broadway, New York, N. Y., has announced the production of a new, heavy duty universal electric impact tool for tough nut running jobs in truck, bus, and industrial maintenance fields.

Known as the Size 34U Impacttool, it has a 1 in. square driver, and is rated for bolts up to 1 1/4 in. size.



Ingersoll-Rand impact tool for rough nut running jobs in the industrial maintenance fields.

The unit employs a heavy duty, universal electric motor and a proven I-R impact unit, placed side by side to reduce overall height, which permits handling truck U-bolt nuts without jacking up the truck. The impact mechanism automatically converts the power of the electric motor to hundreds of rotary impacts whenever sufficient resistance to turning is met. These powerful rotary impacts are said to quickly run nuts up tight, or remove the most stubborn rusted or frozen nuts. The tool is quickly reversed by an easy-to-grip switch, located for convenient operation.

Fundamentals of **BOILER PLANT ENGINEERING**

(Basic Principles of Steam Plant Practice)

By A. D. HOLLAND

*Assoc. Prof. of Mech. Engr.,
Georgia School of Technology*

"Fundamentals of Boiler Plant Engineering"—is different from most handbooks in that it goes into the fundamental principles of boiler plant operation. It is written so that it can be studied by those who have not had an opportunity to learn these basic laws; at the same time its many charts, tables and formulae make it a valuable reference book for the trained engineer.

The basic principles covered in this book have such wide application that it will be extremely helpful to refrigeration, air conditioning, textile and hydraulic engineers and master mechanics. Stiff cover, cloth binding. $4\frac{1}{2}$ x 7 inches, 232 pages, 37 tables, 55 illustrations, 30 memorandum pages for your special notations. "FUNDAMENTALS OF BOILER PLANT ENGINEERING" may be secured with a 3-year subscription to SOUTHERN POWER & INDUSTRY for \$3.00.

Take advantage of this special offer while it lasts. Write today to

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806 Peachtree St., N.E., Atlanta 5, Georgia

Patent
Pending



Now!

A New Safety Valve, Built on a Better Principle

This improved equipment has the seat and moving parts of stainless steel; no danger of rusting fast! The parts are self-aligning and accurately made. The opening is full, giving the valve much greater capacity than earlier types.



Dual-outlet Valve Permits Re-seating and Testing Safety Valves While Refrigerating Plant Is Operating

The new valve can be re-seated after it opens. It meets the requirements of the latest A.S.M.E. and A.S.A. B-9 Codes. Built in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and $1\frac{1}{4}$ " sizes.

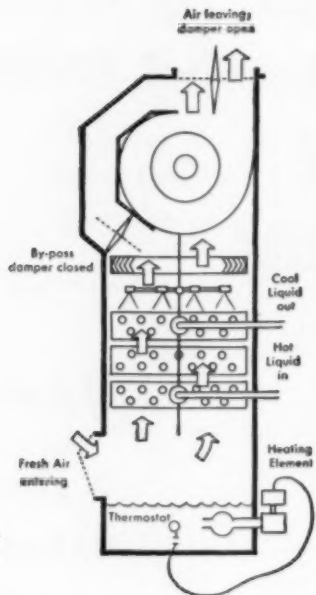
Sensitive, dependable, and safe, this valve will give your refrigerating system the adequate protection you need.

Order today from your nearest Frick Branch or Distributor, or direct from

DEPENDABLE REFRIGERATION SINCE 1882
FRICK Co.
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Also Builders of Power Farming and Sawmill Machinery

NIAGARA Aero Heat Exchanger



U. S. Reissue
Patent Nos. 22,533
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1. Extends quenching capacity without extra water or cooling tower.
2. Quickly pulls down heat at initial peak load of Quenching.
3. "Balanced Wet Bulb" Control holds quench bath at proper temperature, heating if needed to start after shut-down, and cools or heats by automatic control.
4. Saves cleaning expense as compared to cooling tower which picks up acids and fumes from air.

APPLICATIONS

Quench Oils
Cutting Oils
Lubricating Oils
Cooling water and
brine
Cooling gas and
compressed air

USED IN THE MANUFACTURE OF OVER 400 PRODUCTS INCLUDING

Aluminum, copper, steel, nickel and alloys.
Diesel, aircraft, automotive and other engines.
Chemical processes, plastics, adhesives.
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Wire, controls, electronic products.
Ammunition, explosives, shells, ordnance, firearms.
Farm machinery, tools, hardware.

*For help in increasing production, saving of cooling water,
write for Bulletin #120. Address*

NIAGARA BLOWER COMPANY

Over 35 Years' Service in Industrial Air Engineering

Dept. SP, 405 Lexington Ave.

New York 17, N. Y.

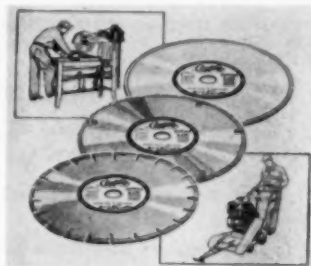
Experienced District Engineers in all Principal Cities

new equipment (continued)

For more data circle item code number
on the postage free post card — p. 17

Concrete Cutting Blade

K-4 CLIPPER MANUFACTURING COMPANY, 2800 Warwick, Kansas City 8, Mo., has developed concrete-cutting diamond blades in addition to their line of diamond blades designed for the cutting of hard-vitreous materials.

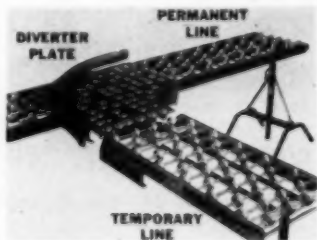


Concrete containing limestone aggregate can be sliced up to 10 fpm when cutting at a depth of 1-in. with Clipper Diamond Blades.

According to the manufacturer, concrete containing limestone aggregate can be sliced up to 10 fpm when cutting at a depth of one inch. Asphalt containing the same aggregate, and cut to the same depth, can be sliced at the rate of 12 fpm. Specifications of the new diamond blades are available for all types of aggregate and age of concrete. These blades are manufactured in diameters from 8 to 18 in. and in thicknesses of 5/32 to 7/64 in. for use on any type concrete saw.

Flow Diverter

K-5 THE RAPIDS-STANDARD CO., INC., 342 Rapistan Bldg., Grand Rapids 2, Mich., has developed a Flow Diverter that connects at any point on a permanent



Flow diverter of The Rapids-Standard Company.



WHAT IT TAKES

There's a lot more to an efficient prefabricated piping job than just bending and welding. It takes an organization of specialists—capable of interpretative engineering, of turning out manufacturing drawings and specifications; experts in metallurgy and skilled personnel backed by the most modern plant facilities . . . Then, and *only* then can you be assured of getting an installation that meets every requirement. You'll find all these essentials here at Power Piping.

POWER PIPING DIVISION OF BLAW-KNOX CONSTRUCTION COMPANY

1525 PENNSYLVANIA AVENUE
PITTSBURGH 12, PA.



It is urgently needed to keep the steel mills going at full capacity to meet the needs of industry and the national defense program. Scrap in your plant or factory will bring high prices. Cash it in now!

THIS is serious business. Steel mills must have more scrap—and now! Otherwise output will drop and all steel users will suffer.

You can do your part, and profitably so, by rounding up all possible iron and steel scrap in your plant and selling it to your nearest scrap dealer. He will get it back to the steel mills.

Old, replaced machinery and equipment, rails, structural parts and other "heavy" scrap are needed mostly. But metal-working waste—turnings, borings, punchings, crop ends, and the like—is also needed.

Prices for iron and steel scrap are high. The need is urgent. Act now. Get in the scrap so the mills can get out the steel!



**Atlantic Steel
Company**

ATLANTA, GEORGIA

new equipment (continued)

For more data circle item code number on the postage free post card — p. 17

line of Rapid-Wheel gravity conveyor to move cartons in and out of storage bays without manual handling.

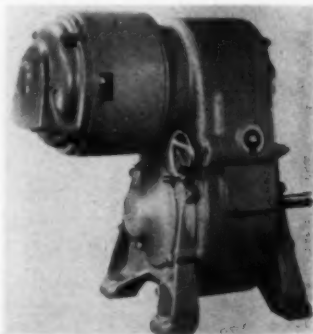
The Flow Diverter kit is made up of a connecting yoke fastened to a 3 ft section of aluminum Rapid-Wheel; and a slotted aluminum Diverter Plate which has conveyor wheels projecting slightly above the surface. An adjustable curved aluminum guard rail also is included in the kit.

Temporary spur lines can be set up quickly and easily on either side of a main conveyor line with this new attachment. To set up a spur line, the connecting yoke bracket is hooked over the side frame of the permanent conveyor at the desired switching point, and a support stand placed under the opposite end of the 3 ft aluminum wheel section. The Diverter Plate is then placed on the permanent conveyor line at the intersecting point to transfer goods from the main line to the spur or vice versa. Gravity sections may be added to the outer end of auxiliary line to flow cartons into and from deep storage bays.

Electric Power Drives

K-6 **STERLING ELECTRIC MOTORS, INC.,** 5401 Anaheim-Telegraph Road, Los Angeles 22, California, have introduced new larger horsepower electric power drives to meet the demand for variable speed drives of 20 and 25 hp ratings.

The Drip-Proof model is designed to prevent liquids or any foreign ma-



One of Sterling Electric Motors' Speed-Trol electric power drives, designed to meet variable speed drives of 20 and 25 hp ratings in chemical, metalworking, food and plastic industries.

THE PEERLESS TYPE

Continuous Duty

A

General Purpose

PUMP

General Characteristics • SINGLE STAGE HORIZONTAL SPLIT CASE DESIGN

DOUBLE & SINGLE SUCTION (Double Suction Sizes 1½" through 48";
Single Suction Sizes 2" & 3")

BOTTOM SUCTION (Bottom Suction Sizes 12" through 42")

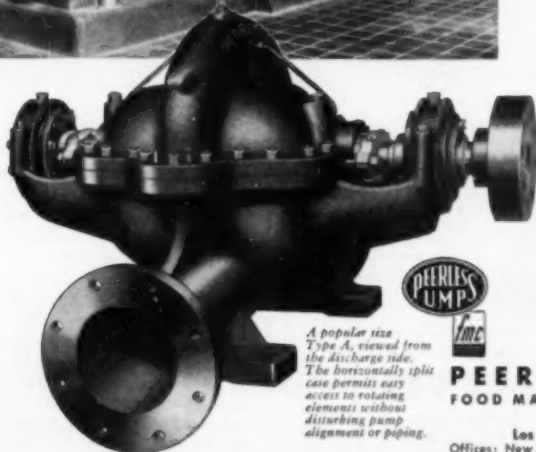
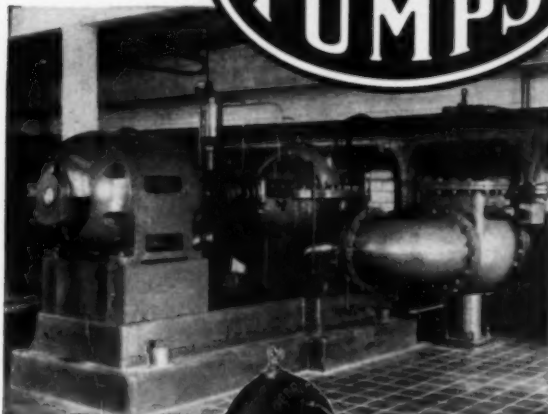
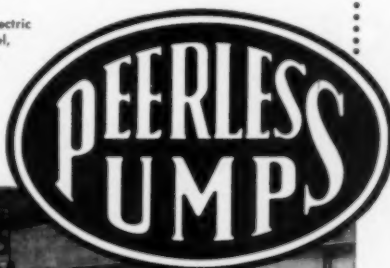
BALL BEARING

CAPACITIES: Up to 70,000 g.p.m.

HEADS: Up to 300 feet.

DRIVES: Direct-connected electric
motor; belted drives; diesel,
natural gas, and gasoline
engine; steam turbine;
combination drives.

TEMPERATURES:
Handles liquids
up to 300° F.



A popular size
Type A, viewed from
the discharge side.
The horizontally split
case permits easy
access to rotating
elements without
disturbing pump
alignment or piping.

TYPE A for All purpose pumping

Peerless Type A pumps can be used in the widest variety of general pumping services, handling clear water and light alkaline fluids, where no solids are in suspension. Applications vary from pumping water for cooling engine jacket water, to providing plant water supply.

TYPE A for Advanced design

Peerless Type A pumps are of the ball bearing type with horizontally split casings, for ease of inspection and maintenance. All are furnished with double suction impellers except in three small sizes where single suction design is employed. Bottom suction can be furnished in all sizes from 12" through 42".

TYPE A for All capacities and heads

Peerless Type A pumps offer users greatest range in capacities, delivering up to 70,000 g.p.m. Type A characteristics permit pumping against heads up to 300 feet. Liquids of temperatures to 300° F. can be safely handled.

TYPE A for Ample safety factor

The mechanical design of the Peerless Type A pump is as superior as its hydraulic characteristics. Oversize shafts, heavy duty ball bearings, modern design wear rings and shaft sleeves all contribute to ample protection against wear, afford a high factor of safety in operation and assure reliable service and extended pump life.

TYPE A for Accuracy in construction

Careful attention to every detail of design is evident in the Peerless Type A pump. For example, bearing seats are cast and bored integral with the case, assuring permanent alignment. All parts are machined to gauge on an interchangeable part system and are rigidly inspected in process.

TYPE A for Added service life

Every Type A pump is fully tested in Peerless' modern hydraulic testing laboratory, which can duplicate the field conditions under which the pump will be used. Experienced Peerless trained engineers located near you are at the service of pump users, architects, contractors, etc., to see that the Type A pump matches or exceeds expectations. Write for Bulletin B-1300 describing and illustrating Type A pumps in detail.

PEERLESS PUMP DIVISION FOOD MACHINERY AND CHEMICAL CORPORATION

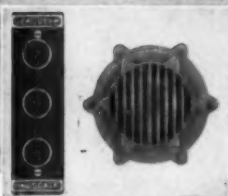
Address inquiries to Factories at:

Los Angeles 31, California and Indianapolis 8, Indiana
Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix,
Dallas, Plainview and Lubbock, Texas; Albuquerque, New Mexico.



ACCURATE Liquid Level Readings AT REMOTE POINTS with the **JERGUSON TRUSCALE GAGE**

Available with Visible and Audible Alarms and Repeaters at auxiliary points.



THE Jerguson Truscale Gage reproduces your boiler water, deaerating tank, or other liquid level at remote points with accuracy as close as $\frac{1}{2}$ of 1%. This is made possible by a design which transmits movement changes in a mercury-filled manometer through a specially designed featherlight pointer system. A unique magnetic coupling, with a magnetically energized yoke operating on precision bearings, uses the maximum of coupling force available with a minimum of inertia in the pointer system.

The extreme sensitivity and close accuracy of the Jerguson Truscale Gage gives you *dependable liquid level readings at remote points*. The Truscale Gage has a built-in adjustment for easy calibration for any W.S.P. The dial is illuminated, the scale markings and pointer glow in the dark, and the gage is available with visible and audible alarms.

Investigate this exceptional remote reading liquid level gage. Write for data unit on Jerguson Truscale Gage.

JERGUSON

Gages and Valves
for the Observation
of Liquids and Levels

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European Mfg. Affiliate: Bailey Motors & Controls, Ltd.

new equipment (continued)

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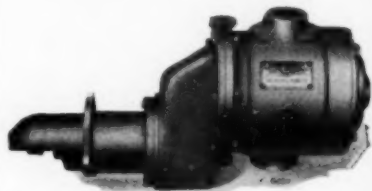
terial from falling into the motor. Motor housing and variable speed transmission case are made of gray iron castings to provide protection against corrosion from moisture-laden or chemical atmospheres.

Outstanding features of this Speed-Trol are positive adjustment of pulleys, infinite speed variation, and accurate control of speed under varying loads.

Air Starting Motors

K-7 INGERSOLL-RAND COMPANY, 11 Broadway, New York, N. Y., announces two new air starting motors for cranking gasoline and diesel engines.

The motors are expected to be used in the lumbering, petroleum, mining, marine, heavy construction, and power fields. They are designed for cranking diesel and gasoline engines with piston displacements up to more than 3500 cubic inches. Although normally operated by compressed air, they are also suitable for operation on natural gas where available at sufficient pressure.



Ingersoll-Rand air starting motor designed for cranking diesel and gasoline engines with piston displacements up to more than 3500 cu in.

According to the manufacturer, an advantage of these starters is the ease of installation. The housing of the air starting motor can be rotated on the gear case, or the gear case rotated on the motor bell housing to clear projections on the engine.

The starters are available in two sizes: the Size 9BM, which develops up to 16 hp and requires approximately 7 cu ft of air per start; and the Size 20 BM, which develops up to 41 hp and requires approximately 16 cu ft of air per start. The smaller size weighs 40 lb and the larger size 103 lb.

Call on us...

if you need help with pipe or tubing problems



UNDER present conditions when the Nation's industry is being called upon to perform new miracles of production, a dependable, ample supply of power becomes of utmost importance. For that reason it will pay you to be sure that you have the very *latest* information that will enable you to select pipe and tubing that you can confidently count upon to give you the utmost efficiency and reliability in your plant operation.

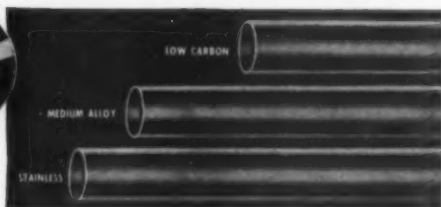
In our more than 60 years as the world's largest manufacturer of tubular products, NATIONAL Tube Company has built up a file of case histories that is probably unequalled anywhere. More than likely the particular tubular problem that has you stumped has already been encountered by us before . . . and successfully solved.

NATIONAL Tube manufactures seamless pipe and tubing in a *complete* range of steel analyses from low carbon, through the alloys on up to and including the stainless steels. Furthermore, we produce them in a wide range of sizes and wall thicknesses and for practically every mechanical and pressure purpose.

Remember, power is the very heart of our industrial effort—so take advantage of our specialized knowledge if you have tubing problems. Let us help you get the *most* out of your pipe and tubing—better service, longer service, and more dependable service. We'll be glad to cooperate.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
(Tubing Specialties Division)

COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



NATIONAL Seamless PIPE AND TUBING

UNITED STATES STEEL

PROTECT YOUR EXPENSIVE BOILERS!



Multiply power safety with Reliance Double-Check Water Level Supervision

● The approved modern way to protect your valuable boiler investment is to have *double* water level reading facilities. Reliance Water Columns and Gages and the remote reading EYE-HYE supply an outstanding combination of *safety* and *convenience*. They guard against any slighting of water level supervision that might result in lost production time and costly accidents.

The Reliance Water Column (1) with rugged Flat Glass or Mica-sight Gage provides a reliable check at the boiler drum. EYE-HYE (2) brings an accurate reading to the operating floor—a convenient means for frequent "operating station" check. Illuminated indicating fluid in the EYE-HYE insures mistake-proof reading. (The Unitemp, (3) standard EYE-HYE accessory, maintains an even temperature in both connecting tubes). Ask your nearest Reliance Representative, or write to the Factory.

THE RELIANCE GAUGE COLUMN COMPANY
5902 Carnegie Avenue • Cleveland 3, Ohio

The name that introduced safety water columns....in 1884

Reliance®

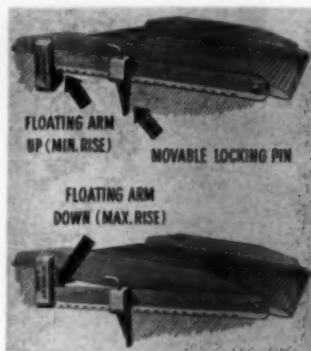
BOILER SAFETY DEVICES

new equipment (continued)

For more data circle item code number on the postage free post card — p. 17

Locking Device

K-8 ELIZABETH IRON WORKS, INC., P. O. Box 360, Elizabeth, N. J., have announced the development of a new, improved self-leveling locking device and floating arm for their "One Man Bridge Ramp," a 15,000 lb capacity device designed for use with fork lift trucks on railroad sidings.



New locking device for Elizabeth Iron Works' "One Man Bridge Ramp".

The new locking pins are an integral part of the floating arm locking bar which travels back and forth in its own housing along the floating arm and secures the ramp by butting up firmly against the loading platform. The patented sleeve permits the floating arms to rest flat on the lowest or highest levels for 90 degree angle bearing of the locking device against the platform.

There is a size and type of "One Man Bridge Ramp" to span gaps from 5 to 58 in. with differential in height up to 7 in. The riding surface is non-slip steel plate reinforced with shock plates at corners. Transported to location between platform and freight car, between two freight cars or platform and motor truck on the forks of any fork lift trucks, the ramp is set into place and forks withdrawn. Lift handles drop into place providing a flush riding surface.

Heavy Duty Oils

K-9 THE TEXAS COMPANY, 135 East 42nd St., New York 17, N. Y., is marketing a new series of heavy-duty engine oils, Ursea Oil X Sup. One 10, 20, 30, 40,

MASTROL SYSTEM
for Forced Hot
Water Heating



PNEUMATIC CONTROLS

FLOWRITE
Diaphragm
Valve

Pneumatic
Switches

ACCRITEM REGULATOR
Compressed Air or
Water Operated

METAFLOW
Valve
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Series 100
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Regulator

Pneumatic

Right:
Static
Pressure
Regulator



Left:
Series 100
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Self-
Operating



Thermostatic
Water Mixers

No. 11 Self-Operating Regulators



PNEUMATIC
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Thermostat

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Radiator
Valves



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Available



AIRSTREAM
Thermostat



POWERSTROKE



Damper
Motor



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TEMPERATURE and HUMIDITY CONTROL

For Heating and
Air Conditioning Systems
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Water Heaters • Heat Exchangers
Jacket Water Cooling

All Types of Baths
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Most of your control problems
can be solved successfully with the aid
of a POWERS engineer and the proper
application of some of our modern
products. Why not profit from our 60 years
of experience? There's no obligation.
Phone or write our nearest office.

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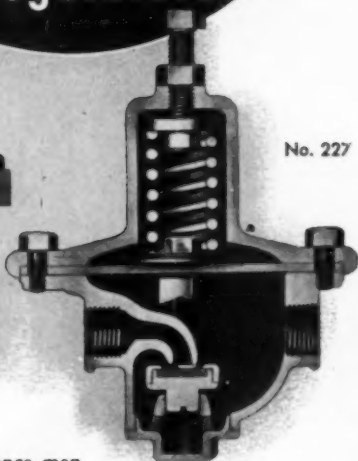
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ATLANTA, GA., 142 Spring St., N. W.

HOW TO PUT THE
"Freeze on"
 Pressure Reducing
 Problems...
 USE
MASONEILAN
 Regulators



NO. 33



No. 227

Production and maintenance men can count on Mason-Neilan Pressure Reducing Valves to give accurate control of steam, water or air. Quality constructed of high grade materials they give long-lived service . . . require minimum of maintenance because they are *built up to the job* not down to price.

No. 33 for steam or air service—sizes from $\frac{1}{8}$ " to $\frac{3}{4}$ ". Reduced pressure ranges 2-20; 20-40; 40-100 psi. Maximum working pressure 200 lbs.

No. 227 for water service — sizes $\frac{1}{4}$ " to 2". Reduced pressure ranges 10 to 60 psi. Maximum working pressure 150 psi. Also available for air service from $\frac{1}{8}$ " to 1".

MASONEILAN

Your local Mason-Neilan Industrial Distributor
 Is Ready to serve you from stock; or Write—

Mason-Neilan Regulator Company

1206 ADAMS STREET, BOSTON 24, MASS., U.S.A.

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 Mason-Neilan Regulator Co., Ltd., Montreal and Toronto

See our Exhibit in Booths 210-210 at the Sixth National Instrument Exhibit, Sam Houston Coliseum, Houston, Texas, September 10-14, 1951.

new equipment (continued)

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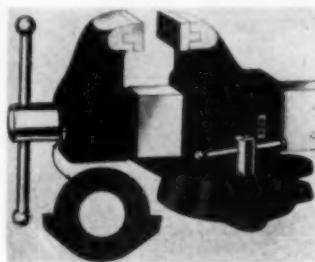
and 50, for the lubrication of heavy duty gasoline engines and automotive type Diesel engines which are operated under adverse conditions.

Among the factors contributing to the increase in the severity of lubricating requirements in certain types of these engines are design changes, use of a wide variety of fuels, and use of high sulfur content Diesel fuels. Increased engine deposits and greater wear have resulted from the use of such fuels, with other oils.

The new Texaco Ursa Oil X Sup. One series was developed by the company's research laboratories to provide a heavy duty lubrication for application wherever an oil meeting the requirements of U. S. Army Specification 2-104B, Supplemental List No. 1, is desired.

Machinists' Vise

K-10 THE COLUMBIAN VISE & MFG. CO., 9021 Bessemer Ave., Cleveland 4, Ohio, has announced an improved line of malleable iron machinists' vises.



Malleable iron machinists' vise of The Columbian Vise & Mfg. Co.

An outstanding feature is use of a new type graphite-bronze, self-lubricating thrust bearing located at the front of the sliding jaw. This absorbs thrust of the steel screw head, provides easy and positive operation, at the same time preventing wear and eliminating "end play".

Steel ball handle ends are forged from the handle stock itself.

The vises are made in all standard sizes—3 to 8 in. jaw widths. Hardened tool steel jaw faces of "T" section design are pinned into the castings so they cannot come loose in use, but can be easily replaced if chipped or worn.



TOUGH LAYOUTS

- ✓ Assured Safety
- ✓ Efficient Operation
- ✓ Minimum Fuel Costs
- ✓ Low Maintenance
- ✓ Long, Trouble-Free Life



MADE SIMPLE BY NAVCO

The high degree of skill acquired by Navco Engineers from long experience in solving unusual Piping problems is your guarantee of an accurate and workman-like Piping System.

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NAVCO PIPING

NATIONAL VALVE & MANUFACTURING COMPANY • PITTSBURGH, PA.

NEW YORK • CHICAGO • CLEVELAND • BOSTON • ATLANTA • TULSA • BUFFALO • CINCINNATI

new equipment (continued)

Electric Screen Heater

K-11 F. R. HANNON & SONS, 1655 Waynesburg Road, S.E., Canton, Ohio has developed an electric screen heater which is applicable to screening of moist clay



Left: Unheated screen used in screening clay for several minutes operation. Note total blinding of mesh. Right: Screen heated by Hannon Electric Screen Heater after one hour operation on same clay. Note complete absence of binding.

used in brick and tile manufacture; screening of sand, coal, lime, ores, chemicals and other materials which contain moisture and are not readily

For more data circle item code number on the postage free post card — p. 17

inflammable or explosive and are non-conductors.

For use with woven wire screen, No. 2 mesh or smaller, the heater is said to be inexpensive to operate and will perform successfully on either new or old gravity or vibrating type installations.

The unit consists of a specially-designed step-down transformer which converts 220, 440 or 550 volt alternating current to low-voltage heating current. The low-voltage current is then delivered through high amperage cables to special bus bars which extend the full length of the screen on each side.

The screen acts as resistance to flow of the low-voltage current and is heated just enough to reduce the moisture content of the material as it passes over the mesh.

Insulation Connections

K-12 AIRCRAFT-MARINE PRODUCTS, INC., 2100 Paxton Street, Harrisburg, Pa., has announced the development of an insulated closed-end connector that can



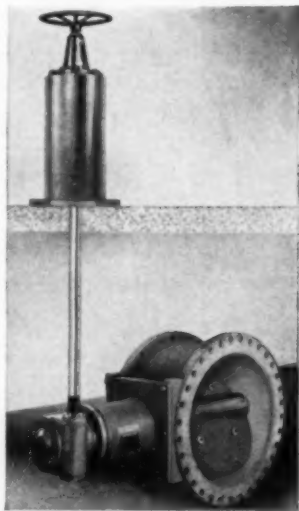
Insulated connections of Aircraft-Marine Products, Inc. are completely installed by one stroke of a tool.

be used on both solid or stranded wires.

The new connector requires but two sizes to cover the entire wire range from No. 22 to 10. These color-coded terminals are trade-marked "BOMB-TAIL" connectors because of their novel shape. They can be completely installed by one stroke of a tool. Inner seam of pure copper terminal is brazed for extra strength and one tool crimps both sizes.

Heavy Duty Control Valve

K-13 R-S PRODUCTS CORPORATION, an S. Morgan Smith Company subsidiary, 4600 Germantown Ave., Philadelphia 44, Penna., announces their heavy-duty valve No. 788, which is equipped with totally enclosed gear reduction drive, extended shaft and floor stand. Sealing of water pressure obtained by utilizing a babbitted seat in the body and Monel or stainless steel welded to periphery of the valve disc. Remote, automatic or semi-automatic controls are also available for this type of valve.



R-S Products Corporation's manual control valve features babbitted seat. With 350 ft head of ambient water, a 36-in. valve with a babbitted seat has leakage of only 50 gph.

BOILER TUBE CO. OF AMERICA

Tube Stocks and Bending

BOILER TUBE CO. OF AMERICA

McKEES ROCKS, PA.

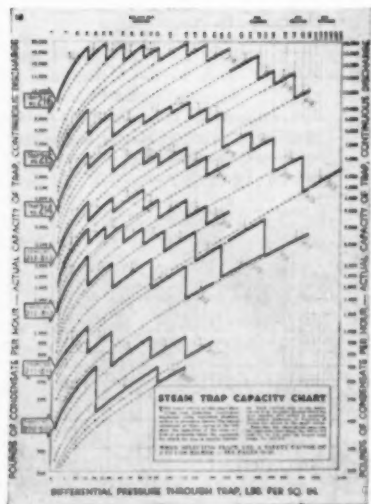
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FRED S. RENAULD & CO.,
LOS ANGELES

**Only actual hot condensate
capacities give a true picture
of steam trap value**

YOU KNOW THE CAPACITY
WHEN YOU BUY AN ARMSTRONG



IT PAYS TO KNOW BEFORE YOU BUY!
THE ARMSTRONG STEAM TRAP CAPACITY CHART is based on hundreds of tests with hot condensate. You can depend on its accuracy.

SEE OUR CATALOG
IN SWEETS OR CEC



The 36-PAGE STEAM TRAP BOOK gives Armstrong trap capacities and tells how to select the right size trap for every job. Ask for a copy.

THEORETICAL calculations fail entirely to give a true picture of trap capacity. Orifice tests fail to account for capacity losses caused by pipe friction. Tests with cold or warm water do not take into consideration the capacity-reducing effect of flash steam. Only tests with actual trap hookups handling hot condensate will tell you the true continuous discharge capacity of a steam trap—and those are the capacities Armstrong gives you.

If capacities are misleading you may buy a trap too small for the job. Or, if you compare different makes of traps on a price basis you must know if they are comparable on a capacity basis or the comparison means nothing.

Dollar for dollar and size for size Armstrong steam traps give you greater capacity—another reason why they are your wisest buy. Your nearby Armstrong Representative can supply you. Call him for recommendations.

ARMSTRONG MACHINE WORKS
806 Maple Street • Three Rivers, Mich.

ARMSTRONG STEAM TRAPS

Lift Truck

K-14 MARKET FORGE COMPANY, Everett, Mass., has introduced the new **LOAD-MOBILE** electric lift truck equipped with a narrow lifting platform, designed to suit special applications.



Market Forge Company's narrow lifting platform trucks for special applications.

The width of the platform is only 18 in. and it can be furnished in 6, 7, 9 and 11-in. lowered heights to engage conventional platforms. These trucks have been built as narrow as 15 in. to meet special conditions.

A set of stabilizing casters are placed on each side of this unit be-

cause of the tendency of such a narrow model to tilt in making sharp turns, etc. These casters are spring-mounted and in normal operation completely clear the floor. They are called into action only when the unit tilts, whereupon heavy springs return it to normal position.

The truck is battery operated and features 3-way operating positions. It is also available in conventional widths; as a pallet truck for handling doubled-faced pallets, as a freight and pick-up truck, as a tractor and as a fork truck.

Pedestal Press

K-15 OWATONNA TOOL COMPANY, 395 Cedar Street, Owatonna, Minn., announces a new

pedestal press for use with the Power-Twin Hydraulic Puller.

The press is portable and compact, the base being only 20-in. x 21-in. Applicable to production, assembly line, and maintenance operations, it may be temporarily or permanently installed in a convenient place near permanent equipment.

Press is designed especially for use with the Power-Twin 17½-ton ram which is used for pulling and in-

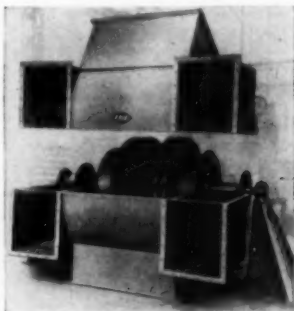


Owatonna Tool Company's pedestal press for use with the Power-Twin Hydraulic Puller. Application — pulling wheels, pulleys, bushings, collars, couplings, gears, shafts and bearings.

stalling jobs. Unit includes the pedestal and press frame—other accessories are available to do many types of jobs.

Forced Draft Fan

K-16 PRAT-DANIEL CORPORATION, East Port Chester, Conn., has developed a forced draft fan embodying many new features that improve aerodynamic characteristics and more efficient conversion of velocity to static pressure.



According to the manufacturer, improvements include large, deep inlet cones streamlined to reduce turbulence at the inlet; open space between the wheels of double-wheel models, instead of a common center disc, permitting complete four-way diffusion of the air leaving the wheels; and an oversize housing to assist diffusion.

These features are said to provide a more complete conversion of velocity pressure to static pressure, and make possible the higher efficiency of these fans.

Don't let your subscription lapse . . . October will be a **BIG** issue

Better Production In Southern and Southwestern Plants

The 1951 **BETTER PRODUCTION** ISSUE of S.P.I. will present specific information showing how better performance is being obtained through improvements in:

Buildings & Equipment
Power & Steam Generation
Piping & Valve Systems
Electrical Systems & Control
Power Transmission & Utilization
Lubrication & Maintenance
Materials Handling

Industrial Water Systems
Air Conditioning, Heating & Ventilation
Lighting & Other Facilities
Instruments & Controls
Production Equipment
Manpower Utilization
Other Functions of Broad Interest

CASE STUDIES will show exactly how production has been improved in specific Southern and Southwestern Plants. While emphasis will be placed on increased production, related improvements such as equipment modernization, better maintenance, fewer rejects, reduced operating costs, etc., will be included as part of the overall **BETTER PRODUCTION THEME**.

THE OBJECT of the entire issue will be to present a large number of proven procedures and improvements that may be copied and put to work toward increasing output and improving performance of Southern and Southwestern plants.

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Firm

Position

Products manufactured or nature of business.

Positioning Equipment

K-17 LEWIS-SHEPARD PRODUCTS, INC., 194 Walnut Street, Watertown 72, Mass., announce a new addition to their line of materials handling equipment known as the "Working Height Lifter."



The 4,000 lb capacity Lewis-Shepard working height lifter is remote controlled by pedal switches.

This new piece of positioning equipment keeps the work at convenient height, thus eliminating unnecessary lost time and reducing operator fatigue and danger of injury. Lifting, stopping and lowering of the load are controlled by remote pedal switches which can be conveniently located since they are mounted on a single steel plate at the end of a 15 ft long heavy duty rubber electrical cord.

The lifting and lowering mechanism consists of a 1/3 hp 115 volt, 60 cycle, a-c motor connected to a patented piston pump which delivers oil under pressure to the hydraulic lifting ram. The ram itself is fitted with a chrome-plated plunger, replaceable bronze guides, spring loaded packing and a flow regulator valve to control lowering of the platform at a safe uniform speed under all load conditions.

The unit is made in 4000 lb capacity, 42 in. lifting height, 72 in. overall height in platform widths of 32" or 38". No special preparation is needed for the Working Height Lifter as it sets directly on the floor and can be plugged into almost any light socket for power.

Lift Truck

K-18 HYSTER COMPANY, 2902 N.E. Clackamas St., Portland 8, Oregon, has developed an improved wheel design on the company's 4,000 lb capacity fork lift truck.

All model YT-40 lift trucks are being equipped with dual wheels in-

DARTS give a TIGHT JOINT

Without Excessive Wrenching!



This True Ball Joint Makes the Difference

Brutal wrenching is never necessary with a Dart Union. Both bronze seats—accurately machined then spherically ground—have wide, true-bearing surfaces that always give a drop-tight joint. No need to jam a Dart; no need to question but what it will stay tight.

And, because body and nut are made of practically indestructible, high-test, air-refined malleable iron, you can be sure they'll laugh off rough abuse—give the vital joint the ultimate in protection.

Little wonder Darts are first choice of shrewd buyers coast to coast.

DART UNION COMPANY

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The Fairbanks Co.—Distributors
Boston New York Pittsburgh



DART

UNIONS



Rear view of the Hyster YT-40 (4,000 lb capacity) fork lift truck showing dual wheels instead of a single wheel on steering trunnion. Design improvement permits easier steering, requiring only 7 turns of the steering wheel instead of 10.3 formerly to swing the trunnion 120 degrees. Present single wheel models can be converted.

stead of a single wheel on the steering trunnion. Present single-wheel type Model 40s can be converted to dual wheels with a minimum of alteration. The removal of one easily accessible lock stud permits rapid and convenient tire service and maintenance.

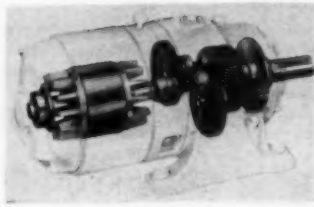
The new design also has reduced the gear ratio in the steering mechanism from 31 to 1 to 20.7 to 1. Even when the truck is stationary, the trunnion can be turned with a minimum of effort.

The Model 40 industrial type pneumatic tire size has been reduced to 6.00 x 9 to provide interchange with tires on the Model 20 (2,000 lb capacity) lift truck.

Gear Motors

U. S. ELECTRICAL MOTORS, K-19
INC., 200 East Slauson Ave., Los Angeles 54, Calif., have developed a new principle in geared motors known as their Type GL Syn-crogear.

By using two secondary pinions to drive the output gear, the effective torque rating of a conventional single pinion and gear unit has been doubled. Incorporating the use of a splined



Two secondary pinions drive the output gear in U. S. Electrical Motors' Syn-cro-gear Motor.

herringbone pinion to equally divide the load between the two secondary pinions, the equipment produces high torque at low speeds.

It is available with ratings of 5 to 25 hp and with speeds from 30 to 84 rpm. Other features are asbestos-protected windings, normalized castings, solid centricast rotors and Lubri-flush lubrication.

Variable Speed Drive

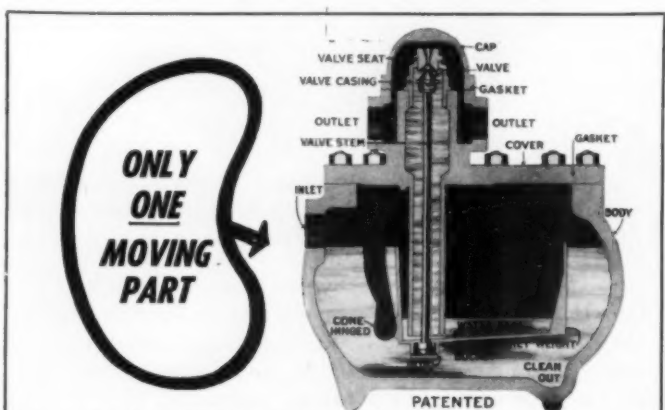
SPEED SELECTOR, INC., 118 K-20
Noble Court, Cleveland 13, Ohio, is offering a versatile new Countershaft Drive which comes as a complete package unit and provides wide speed variations for a variety of applications.

The new variable speed drive is designed for installations where drive shaft speeds must be lower than motor shaft speeds. This low cost unit utilizes 7 and 8 in. combination sheaves and is available for drives from 2 to 15 hp.

The assembly consists of a sealed ball-bearing countershaft stand, secured by rigid slide rods to an adjustable motor support for all motor sizes up to NEMA No. 326. The built-in control can be mounted in any one of a number of positions to suit the requirements of the installation.



Countershaft drive of Speed Selector, Inc., is available for drives from 2 to 15 hp.



in a Squires STEAM TRAP

Over the long pull, Squires Steam Traps are the LEAST EXPENSIVE to own and operate. These are the reasons why: (1) There is only ONE moving part—the bucket hinge. (2) The larger capacity in both orifice and bucket mean fewer discharges, less wear. (3) You don't have to break main line connections to get at the valve and seat.

You can't beat Squires for economy of operation. It is one steam trap you can INSTALL and FORGET. Write today for complete details. Ask for Catalog No. 100. Write us concerning traps for testing purposes.

IN MANY INDUSTRIES FOR OVER 40 YEARS . . .
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Steel — Pulp & Paper — Meat Packing — Public Utilities — Steam Ship — Distilling — Food Processing
— Textile — Oil — Chemical — and many others.



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NEWS for the South and Southwest

Ebaugh & Goethe—Florida

EBAUGH & GOETHE, Consulting Engineers, GAINESVILLE, FLORIDA, observed the first anniversary of the formation of their firm on August 1st by doubling the size of their office and engineering design department. The firm specializes in mechanical and electrical equipment of buildings. In addition to design, special surveys and engineering reports and cost studies have been supplied for a wide variety of industrial plants.

N. C. ERAUGH is widely known in the South and holds degrees in Mechanical and Electrical Engineering from Tulane University and Georgia School of Technology. He was formerly head of the Mechanical Engineering Department of the University of Florida. Readers of Southern Power & Industry will know him as the author of the Handbook of Air Conditioning, which was published in 1936 by S P & I, and revised in 1946. In addition he is the author of Engineering Thermodynamics and more than 50 technical papers which have been published in various technical journals during the past 20 years.

SAM P. GOETHE holds degrees from the University of Florida, and is widely known in the engineering field.



N. C. Ebaugh

He was formerly Director of the Plant and Grounds Division and Campus Engineer for the University of Florida.

Pittsburgh-Corning—Atlanta

PITTSBURGH-CORNING CORPORATION announces the appointment of J. W. SEVERENCE and H. C. KELLY to their Atlanta District Office, 333 Candler Building, ATLANTA, GEORGIA.

Mr. Severence will handle PC Glass Block and Foamglas Building Insula-

tion and Mr. Kelly PC Foamglas Industrial Insulation.

FUTURE EVENTS

Of Engineering Interest

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, C. E. Davies, Sec'y, 29 West 39th St., New York, N. Y.

Sept. 10-14, Industrial Instruments and Regulators Division and Instrument Society of America Exhibit and Joint Conference, Houston, Texas.

Sept. 24-26, Petroleum Mechanical Engineering Conference, Hotel Mayo, Tulsa, Okla.

Oct. 11-12, Fuels and AIME Coal Divisions Joint Conference, Hotel Roanoke, Roanoke, Va.

Nov. 25-30, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, R. G. MacDonald, Sec'y, 122 East 42nd St., New York, N. Y.

Oct. 15-18, Engineering Division, 6th Annual Conference, General Oglethorpe Hotel, Savannah, Ga.

AMERICAN SOCIETY FOR METALS, W. H. Eisenman, Sec'y, 1381 Euclid Ave., Cleveland 3, Ohio.

Oct. 15-19, National Metal Congress and Exposition; World Metallurgical Congress, Detroit, Mich.

AMERICAN CHEMICAL SOCIETY and THE SOUTHERN ASSOCIATION OF SCIENCE AND INDUSTRY, H. M. Conway, Jr., Director, SASI, 5809 Peachtree Road, Atlanta, Ga.

Oct. 18-20, Southwide Chemical Conference, Wilson Dam, Alabama.

PLANT MAINTENANCE SHOW, Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

Jan. 14-17, 1952, Industrial Exposition, Convention Hall, Philadelphia, Pa.

Dowell—Tulsa

New modern office building of Dowell Incorporated, a wholly-owned subsidiary of The Dow Chemical Company, is located at 1150 No. Utica Avenue, Tulsa, Oklahoma. Dowell's truck, magnesium anode and chemical manufacturing plants, the warehouse and engineering research laboratories are also located at this address.

Several departments of Dowell, formerly located on the Fifth floor of the Kennedy building have moved into the new building. They are the purchasing, accounting, auditing engineering and maintenance departments.

JOHN G. STAUDT, Executive Vice-President and General Manager of Dowell, said that Dowell will maintain all of the present space in the Kennedy building for the operations, sales, service and product development and stenographic departments.

The exterior and the floors of the building are finished with a new cementitious material now manufactured by The Dow Chemical Company in their Freeport, Tex., plant. Like

Dowell's magnesium anodes for cathodic protection, the new cement is manufactured from sea water.

The new cement, known as Oxyment, is a magnesium oxychloride cement—a combination of magnesium chloride and plastic oxychloride.

The application of Oxyment on the Dowell building is the first large scale commercial use of the material.

Oxyment in its commercial form is

a premix which is prepared much like ordinary cement and is used after adding only sand, water and coloring if desired. It is being used extensively in a non-mix form for flooring, boat decking, railroad car floors, pottery and novelties.

Floors of this magnesium oxychloride cement may be laid over old or new floors and sub-bases. They are permanent, warm, resilient, quiet, dust proof and relatively non-slip.





New vice-presidents of the Double Seal Ring Company, Fort Worth, Texas are F. S. Gould in charge of production; R. W. Hoyt, chief engineer; and Buyrl Wilson in charge of sales.

Double Seal Ring Promotions

Election of three new vice-presidents of the DOUBLE SEAL RING COMPANY has been announced as a phase of an expansion program being carried out by the FORT WORTH, TEXAS, firm, manufacturer of replacement piston rings for industrial and marine uses.

The new officers are F. S. GOULD, who has been works manager and with the company for eight years, now vice-president in charge of produc-

tion; R. W. HOYT, who has been chief engineer with the company for five years, now vice-president and chief engineer; and BUYRL WILSON, who has been general sales manager and with the company for eight years, now vice-president in charge of sales.

D. L. DOHERTY has been appointed special assistant to A. R. CLARK, the firm's vice-president and secretary-treasurer. FRAN SCHMALE, who has been the company's industrial sales manager, is now assistant to R. W. HOYT.

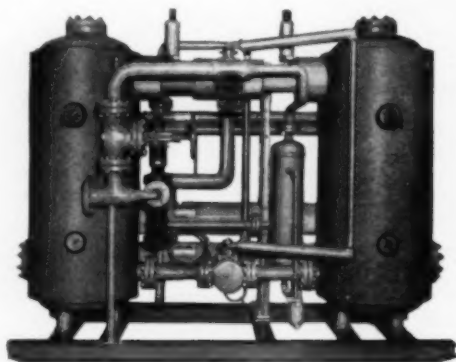
Iron Fireman—Atlanta

THE IRON FIREMAN CORPORATION announces the reopening of its Southern Regional Office, 607 Haas-Howell Building, ATLANTA, GEORGIA. E. V. CROSSIN is manager, HUGH SMITH, is engineer, and J. H. MERRITT, JR., is industrial sales manager for the Southern Region.

Feller Joins KM&G

EUGENE W. F. FELLER, former managing editor of "Industry & Power," has joined the Public Relations staff of KETCHUM, MACLEOD & GROVE, INC., Pittsburgh advertising agency, as an account executive. Mr. Feller who, between 1941-49, had been associate editor of "Power" and also managing editor of "Operating Engineer," comes to the agency with 22 years of practical experience in the supervision and operation of power equipment, and ten years of technical writing and editing.

He is a member of the Instrument Society of America; National Association of Corrosion Engineers; National Association of Power Engineers and the American Society of Refrigerating Engineers.



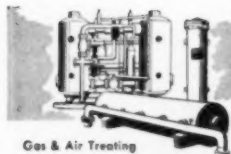
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The Pritchard HYDRYER* is *unexcelled* for dependable dehydration of air and other gases for instrument and process controls. Dual adsorbers provide continuous drying action. Standard packaged units designed to reduce dew points to minus (-) 40°F. Only service connections are required. Specially designed HYDRYER* units can be tailored to your individual requirements.

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Producers of
QUALITY
Specialized Process
EQUIPMENT.

Potomac Edison Promotions

A series of Potomac Edison System promotions was announced recently when H. H. STARTZMAN was named assistant vice president and chief engineer, EUGENE GORDON was made superintendent of power stations, and CECIL McVAY was promoted to assistant superintendent of power stations.



H. H. Startzman, assistant vice president and chief engineer of Potomac Edison.

The announcement of the personnel changes was made at a quarterly PE board of directors meeting. At that time, President R. Paul Smith stated that the changes were necessary to make the services of Vice President George Humphrey and Eugene Gordon available to the West Penn Electric System.

Vice President Humphrey has been drafted by West Penn, PE's "parent company," to act as chairman of the group in charge of West Penn's plant expansion program. Gordon will also be a member of that group.

Startzman has been with the company since 1928 when he was employed to take charge of the Cumberland Merchandise Department. One year later, he was made industrial engineer, advancing in later years to manager of power sales and engineering, and assistant chief engineer.

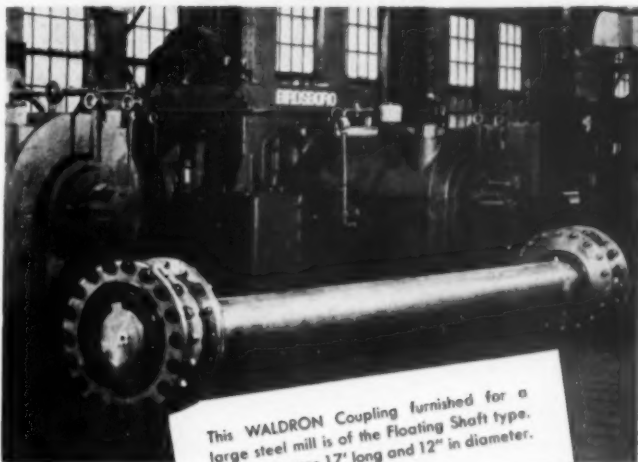
Gordon came with PE in 1923 as assistant chief engineer at the R. Paul Smith Plant. Since that time he has held the company posts of acting superintendent of power, and superintendent of power. He has also been Williamsport's chief engineer and plant superintendent.

McVay has been with the company since 1937 except for a four-year company furlough granted while he was serving in the armed forces during World War II. He started with the company as a relief substation operator and has held various company offices including junior engineer, load dispatcher, assistant plant superintendent and plant superintendent at the Smith Station.

For The **RUGGED** Jobs...

WALDRON Improved Gear Type COUPLINGS

get the nod!



they are built for dependable service

...AND THEY GIVE IT!

Large or small—every WALDRON Coupling is designed and built with typical operating troubles in mind. Forty years of experience has taught WALDRON engineers the pitfalls to be avoided in producing a dependable coupling. The WALDRON design eliminates the usual sources

of trouble; the WALDRON construction is simple and strong—forged steel parts, no welded sections, better lubrication.

The steadily growing preference for these sturdy WALDRON couplings in all major industries is a tribute to the quality and workmanship that goes into them.

Write for this Helpful Folder

explaining coupling features which give added insurance against coupling failure. No obligation.



JOHN WALDRON

CORPORATION

New Brunswick, New Jersey

Authorized Sales Representatives in Principal Cities



New office building of American Air Filter in Louisville was designed and built by the Austin Company with Ronald and Associates, Louisville, the heating and air conditioning engineers.

American Air Filter—Louisville

The new office building, recently completed by the AMERICAN AIR FILTER COMPANY, LOUISVILLE, KENTUCKY, can lay claims to having the cleanest air of any similar building in the country.

Three types of their filters installed in series are used in the air conditioning systems. Outside air is filtered through Multi-Duty automatic viscous filters, Electro-Matic automatic electronic precipitators then through Electro-PL dry type units. Recirculated air by-passes the Multi-Duty but is cleaned by the other two filters. The

reason for this triple filtration is to protect the building interior when new models or designs are tested in the system and also to display the various types of AAF filters and precipitators in actual operation.

The air conditioning is divided into two systems—one serving the front or south side of the building and the other the north side. The "south" plenum chamber is constructed of glazed tile, instead of the usual sheet metal, with plate glass windows on the aisle side. Flush ceiling type fluorescent lights permit viewing the equipment from outside. This system

adjoins the exhibition space where show models of all of the Company's products including those of the Herman Nelson Division are displayed.

A modified Carrier Weathermaster system is used in the new AAF office building with the heating coils and mixing dampers enclosed in Herman Nelson Unit Ventilator Cabinets, another of the Company's products. A thermostat in each office permits individually controlled temperatures to suit the occupant. Humidistats located at various points in the building control the moisture content of the air.

ASME Nominations

REGINALD J. S. PIGOTT, director of the engineering division of Gulf Research & Development Company of Pittsburgh, a subsidiary of Gulf Oil Corporation, has been nominated as 1952 president of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Mr. Pigott heads a slate of new ASME nominees, including four regional vice presidents and two directors-at-large, submitted by the society's nominating committee. Since only one name is presented for each office, nomination is tantamount to election. The new officers are to begin their terms at the conclusion of the ASME annual meeting next December. Mr. Pigott will succeed J. Calvin Brown, of Los Angeles, Calif., engineer and patent attorney.



R. J. S. Pigott

Director of engineering research of Gulf Research & Development Company since 1929, Mr. Pigott's professional record is a long and distinguished one which includes 11 years in the design, construction and operation of central steam power stations; seven years in designing and constructing power and industrial plants; five years in metal manufactures, and 18 years in petroleum engineering research.

Mr. Pigott holds more than 30 patents on devices used in hydraulic



Survey of Plants Shows:—

15 of 20 Engineers Prefer Nicholson Traps

To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson.

The repeated adoption of Nicholson steam traps in plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for our catalog. 5 types for every power, heat, process use; size 1/4" to 2"; press. to 225 lbs.

Catalog 751 or see Sweet's

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engineering, heating, oil production, and instruments. He has written more than 40 technical papers on power station design, fluid flow, instruments, vapor lock, lubrication, superchargers, and aviation fuel and lubrication systems published in technical and trade magazines, in the proceedings of numerous technical societies, and in scientific handbooks. He has rendered extensive service as consulting engineer, as expert in patent litigation, and as designer of power and industrial plant projects.

Mr. Pigott's present position places him in charge of engineering research for Gulf Oil Corp., and its subsidiaries and divisions, with responsibility for Gulf engineering research and design, laboratory buildings, operation of shops and drafting rooms, progress in the techniques, tools, and equipment utilized in producing crude oil, design and fabrication of test equipment, solution of mechanical problems for the corporation's divisions and standard engine testing to qualify fuels and lubricants.

Mr. Pigott's activities and accomplishments in various engineering societies have been outstanding. He became a junior member of The American Society of Mechanical Engineers in 1912, an associate member in 1913, a member in 1918, and was made a fellow of the society in 1938. He served as a vice president of ASME from 1936-1938. His service on numerous committees of the society covers much of the period of his membership. Mr. Pigott was chairman of the ASME Special Research Committee on Fluid Meters from 1916-1946 and was responsible for starting this committee; and was a member of the main Power Test Codes Committee and chairman of the Definitions and Values Committee from 1918-1946.

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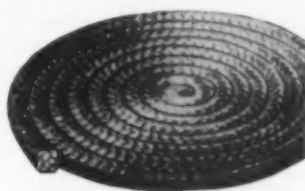
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the company about a year and a half. He will serve North and South Carolina.

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Diamond Alkali—Dallas

Diamond Alkali Company plans an expansion project at its silicate of soda plant at DALLAS, TEX.

The new project, estimated to cost several hundred thousand dollars, calls for the installation of a large furnace to supplement the production of three smaller-type furnaces now in operation. The present furnace building will be remodeled to accommodate the expanded facilities.

The Dallas plant was constructed as a one-furnace plant in 1941. A second furnace was added in 1945, a detergent plant was built in 1946, and the third furnace was placed in operation in 1948. The new facilities are scheduled to be in full production early in 1952.

Aluminum from Texas Lignite

A new aluminum smelting plant, the first in history to use lignite (sub-bituminous coal) for fuel, will be built by ALUMINUM COMPANY OF AMERICA.

Aluminum Company of America today confirmed an announcement by

Congressman W. R. Poage, Democrat of Texas, that the Company has applied to the Department of the Interior for a certificate of necessity to begin construction of the plant in the immediate future at one of several alternate locations approximately 60 miles south of Waco, Texas.

The plant, which will have a production capacity of 85,000 tons of aluminum annually when completed, represents another major contribution by ALCOA to the defense program and to the job of meeting civilian demand for aluminum. Production of metal is expected to start in the early Fall of 1952, and when in full operation the plant will employ approximately 1,000 persons.

The existence of large deposits of lignite (sub-bituminous coal) in the Milam County area has been known for years. The feasibility of using processed Texas lignite as a major fuel source resulted only recently due to new developments in fuel technology.

The large amounts of electricity required by the new plant will be generated by steam-driven equipment using this processed lignite as fuel. The power generating facilities will be built and operated for ALCOA by the TEXAS POWER AND LIGHT COM-

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PANY. Although detailed negotiations have not been completed, the arrangement will provide for an interchange of power between the ALCOA-owned power plant and Texas Power and Light to insure a firm power supply for the aluminum smelter.

Advantages of the ALCOA plant site in Milam County lie not only in the availability of reserves of lignite sufficient to supply fuel needs for many years, but also in the ability of Texas Power and Light Company to supply interim power sufficient for partial operation of the smelter before completion of the generating plant.

Lignite's great promise as a major source of low-cost power was made possible by the Texas Power and Light Company, which sponsored an extensive research and experimental program, and by the Bureau of Mines of the Department of Interior, which carried out the project in a pilot plant at Denver, Colorado.

Engineering surveys show lignite deposits existing to a depth of several hundred feet on the site of a prehistoric river bed. The black, coal-like mineral can be extracted both by strip and slope mining, and thence transported directly to the power plant.

ALCOA previously had placed in operation a gas-fueled aluminum reduction plant at Point Comfort, Texas. The Milam County plant will add another major link to ALCOA's chain of interests in the State of Texas, and an important addition to the growth of the aluminum industry as a whole in this section of the country.

Currently, the Point Comfort plant is being enlarged to produce an additional 35,000 tons annually. Also under construction by ALCOA is a new 85,000-ton smelting plant at Wenatchee, Washington, and a new plant at Bauxite, Arkansas, for the refining of bauxite ore into alumina (aluminum oxide).

In an earlier "quick action plan" started in the Fall of 1950, ALCOA reactivated high-cost standby production facilities at Massena, N. Y., and at Badin, N. C., in order to provide metal quickly for the national stockpile. While operating with power costs in excess of those normally economical, this program is making a substantial emergency contribution to the Government's aluminum reserves. By contract, the low-cost advantages afforded by the lignite-fueled Milam County, Texas, plant should enable this operation to produce competitively under normal economic conditions.

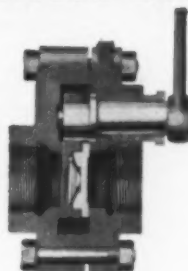
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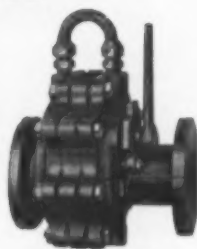
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Assure continuous free flow of any material which congeals at ordinary temperatures.



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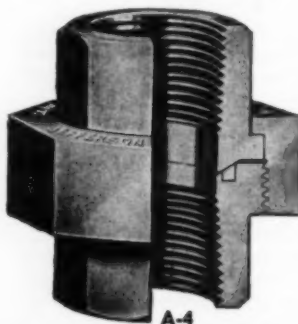
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U. S. Rubber Co., Scottsville, Va.,
and Gastonia, N. C.

Elmer L. Johnson, Jr., has been appointed assistant to the manager of United States Rubber Company's plant at Scottsville, Va. Mr. Donald Carroll continues as plant manager.

Mr. Johnson will also remain industrial relations manager of the rayon tire cord mill, a position he has held since 1946. He joined the company in 1944. A native of Charlottesville, Va., Mr. Johnson attended the University of Virginia and was with the Newport News Shipbuilding and Drydock Company, Newport News, Va., during World War II.

Mr. Johnson succeeds Stephen A. Ward, who is being transferred to U. S. Rubber's combed yarn plant in Gastonia, N. C., as assistant to the plant manager, O. L. Ward.

William C. Johnson Dies

WILLIAM C. JOHNSON, executive vice president of ALLIS-CHALMERS MANUFACTURING COMPANY, died suddenly July 26. He was a member of the firm's board of directors and also a member of the executive committee of the board, and in addition, served as chairman of the board of Canadian Allis-Chalmers.

Mr. Johnson was born in Birmingham, Alabama, on May 25, 1902. He attended grade school and high school in Birmingham and began his career in the electrical industry in 1920 as an apprentice for the Alabama Power Company.

It was here that he first became acquainted with the electrical products produced by Allis-Chalmers, being particularly impressed by one of the firm's hydro-electric installations. He started work with Allis-Chalmers at Milwaukee in 1924 as a machinist helper. During the next five years he worked with the company's field service and erection department.

In 1929 he was named representative of the Allis-Chalmers crushing and cement division in the Atlanta, Georgia, district, which covered seven southeastern states. Six years later he became the company's general sales representative at Chattanooga, Tennessee. In 1937, he was selected to open the company's district sales office in Knoxville, Tennessee.

In 1940 he returned to Milwaukee and was named sales manager of the firm's crushing and cement department. Two years later he was made general sales manager of general machinery products. In this post he replaced the late Walter Geist, who



William C. Johnson

had been elevated to the presidency of the company.

In 1944, Mr. Johnson was made vice president of the general machinery division where he served until his appointment as executive vice president in charge of that division in June, 1947. He was named a member of the firm's board of directors in January, 1948, and in March of the same year was appointed a member of the executive committee. Following the death of Walter Geist, Mr. Johnson was appointed executive vice president in charge of both general machinery and tractor divisions in February, 1951.

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The book emphasizes mathematical development and physical understanding of the behavior of synchronous machines. It is not intended as a reference book; it should be read from the beginning to understand the development of the subject as a whole.

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By THE MATERIAL HANDLING INSTITUTE, INC.

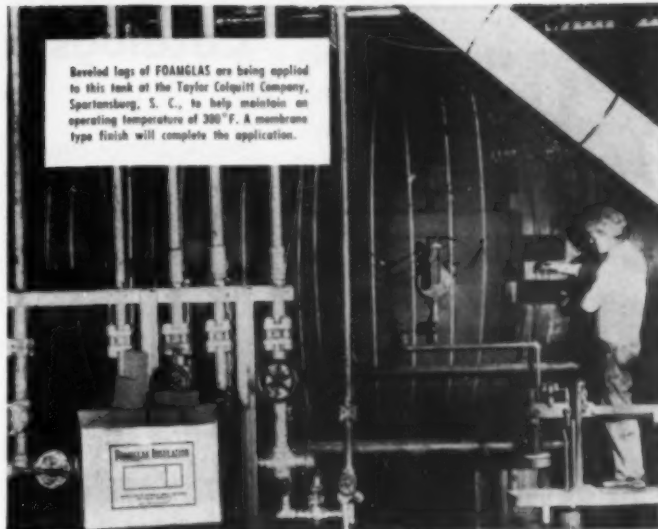
PUBLISHED BY PRENTICE-HALL, INC.
70 Fifth Ave., New York 11, N. Y.
8 x 11 inches—248 pages
Price, \$5.50

"Modern Methods of Materials Handling" is prepared to provide a broader basic knowledge for men in the materials handling division of industry and to increase their on-the-job effectiveness.

Types of industry include: aircraft; automotive; beverages; building material; drugs and chemicals; electrical; food products; foundry; glass; leather; metal products; oil and paint; paper products; printing and publishing; railroads; textiles; tire and rubber.

A section on warehousing covers conveyorized handling, warehouse shipping operations, use of automatic weighers, fork lift trucks and hand trucks, pallet handling in restricted space, Monorail system, swivel casters, jacks and semi-live skids.

The methods, types of equipment, and materials described are in actual use. Installational photographs and diagrams support the text.



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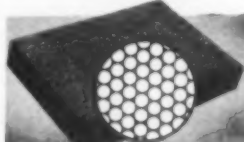
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Catalogs and Bulletins

(Continued from p. 18)

Free additional information is available to readers of Southern Power & Industry. Check item number on the postage free service coupon post card—page 17.

B-10 ELECTRONIC CONTROLS—Bulletin C-350, 18 pages—Illustrates and describes the Dudley electronic control for precision expanding of heat transfer equipment tubes. Discusses operation and maintenance and lists replacement parts.—FRANKLIN MANUFACTURING CO., 149 South 4th St., Philadelphia, Pa.

B-11 FOUNDATIONS—Foundation Brochure, 24 pages—Types and applications of foundation structures, pressure grouting, drainage, de-watering, shoring and sub-surface soil exploration are illustrated and described by use of case histories.—CASEY & CASE FOUNDATION CO., P. O. Box 161, Maywood, Calif.

B-12 GAS TURBINE—Bulletin GEA-5520, 16 pages—Describes the features, application, and operation of the G-E gas turbine for pipeline pumping. Illustrated with photographs, line drawings, and charts.—GENERAL ELECTRIC COMPANY, Schenectady 5, N. Y.

B-13 INDUSTRIAL STEAM—Booklet No. 2171, 8 pages—Sixteen questions and answers offer helpful information regarding the efficient use of steam, and tell "How Increasing Your Steam Costs Can Save Money."—BARCO COMPANY, INC., Empire State Building, New York 1, N. Y.

B-14 RECORD PROCEDURES—Booklet X-1203, 25 pages—Outlines methods for simplifying paper work by laying ground-work for getting desired result, a properly balanced and uninterrupted flow of materials to meet production schedule. Suggests correct set-up of records.—REMINGTON RAND INC., 315 Fourth Ave., New York 10, N. Y.

B-15 DRAINAGE SYSTEM—Bulletin No. 5128, 4 pages—Describes Multi-Plate Underdrain System to channel the upflow horizontally when backwashing a water purifying plant. Illustrated with cut-away sections and a typical installation.—GENERAL FILTER CO., affiliate of LAYNE & BOWLER, INC., Memphis 8, Tenn.

B-16 PROCESS EQUIPMENT—Bulletin 50-1, 12 pages—Illustrates equipment designed and manufactured for the process industries. Material grouped according to use of equipment. Four pages of case histories.—INFILCO INC., Tucson, Ariz.

B-17 INDUSTRIAL FLOORS—Bulletin, 2 pages—Describes new technique for care of heavy traffic floors, including asphalt tile and hardwood. Includes illustrations, diagrams, and case histories.—G. H. TENANT COMPANY, 2528 North Second St., Minneapolis, Minn.

B-18 GRINDERS AND ARBORS—Catalog, 8 pages—Covers complete line of ball bearing bench grinders, arbors, sanding discs and face plates. Includes specifications, dimensional diagrams, and applications.—POLY PRODUCTS, 2032 E. Walnut St., Pasadena 8, Calif.

B-19 CONVEYORS—Catalog No. 31, 40 pages—Describes standard and special types of wire belting weaves with specifications and illustrations. Power formulas, construction details, and maintenance suggestions are included.—KORR-PETTIT WIRE FABRICS AND IRON WORKS, INC., 1505-15 North Maccher St., Philadelphia 22, Pa.

B-20 HUMIDITY CONTROL—Instrumentation Data Sheet No. 10, 1-4, 4 pages—Describes the new concept of humidity measurement that makes possible direct

humidity readings from remote locations. Illustrated.—MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, Brown Instruments Division, Wayne and Windmill Aves., Philadelphia 44, Pa.

B-21 STEAM TRAPS—Bulletin T-1740, 24 pages—Describes and illustrates steam traps for power plants, steam distribution systems, and steam processes. Tells how to figure sizes, gives application diagrams, and describes typical installations.—YARNALL-WARING COMPANY, Mermaid Lane, Chestnut Hill, Philadelphia 18, Pa.

B-22 ENGINEERING DRAWINGS—Handbook SC 638, 6 pages—"How Safe Are Your Drawings" describes equipment to store and protect tracings, drawings, and specifications.—REMINGTON RAND INC., 315 Fourth Ave., New York 10, N. Y.

B-23 HOSE FITTINGS AND OILER—Bulletin H-1200-B44, 4 pages; Specification Sheet H-1200-B45, 2 pages—Bulletin describes hose fittings, including sizes, parts numbers and applications. Specification sheet covers 2 of line oiler.—NORTHINGTON PUMP & MACHINERY CORPORATION, Dunellen, N. J.

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Steel Strapping Questions and Answers

(Continued from page 92)

Q—What is considered the best stowage and bracing method for cylindrical containers of steel, wood or fibre?

A—Each container should contact as many adjacent containers as possible through the nesting of alternate crosswise rows. This provides two-point contact between containers, which materially aids in retaining the shape of the unit. Adequately braced with steel strapping, this provides a strong unit.

Q—Where should steel strapping be positioned to provide maximum protection to the lading?

A—Steel strapping should be positioned to engage the members of the gates or bulkheads which bear against the strong portions of the containers. This equalizes distribution of pressure against the load.

Q—How can any additional expense for car bracing be justified?

A—This can be justified in customer goodwill and the reduction of paper work necessary in claim filing and collection.

Q—What is meant by zone impacts?

A—This refers to graphical representation by zones of miles-per-hour coupling impacts.

1st half of 3rd zone—6 mph.

1st half of 4th zone—8 mph.

1st half of 5th zone—10 mph.

Q—How can equal tension be secured in all steel strapping used to brace the lading?

A—Equal tension can be attained by simultaneous use of one stretcher for each strap.



KENNEDY Fig. 27, Bronze Gate Valve, 125 lbs. steam, 200 lbs. WOG, non-shock

KENNEDY

bronze gate valves...

for low-cost maintenance

TO ASSURE DEPENDABLE OPERATION with minimum maintenance, the complete KENNEDY Line is *job-fitted*... every valve specially designed and engineered for the job it has to do.

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EXTRA TIGHTNESS, without undue wear on the packing, is assured by an unusually deep stuffing box. Stripping of the stem and disc threads is practically impossible. Ribs cast on inside of valve body fit into channels in disc to maintain straight-line operation of all moving parts.

THE STUFFING BOX is provided with gland, and the valve can be repacked under pressure when wide open.

SCREWED BONNET AND WEDGE DISC are standard on the Fig. 27 in sizes from 1/4" to 3". Larger sizes are constructed with bolted bonnets and cam-type double discs with parallel seats. Working pressures 1/4" thru 3": 125 lbs. steam, 200 lbs. WOG, non-shock. 3 1/2" thru 6": 100 lbs. steam, 150 WOG, non-shock.

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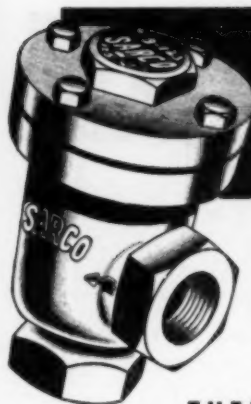
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ADVERTISER'S INDEX

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A

Advertising Council, Inc.	*
Air Preheater Corp.	*
Allen-Bradley Co.	*
Allen-Chambers Mfg. Co.	*
Aluminum Co. of America	45
American Blower Corp.	42 & 43
American Coal Burner Corp.	129
American Engineering Co.	*
American Monorail Co.	*
American Pulverizer Co.	*
Anacosta Wire Cable Co.	*
Anderson Co., V. D.	129
Armstrong Machine Works	111
Atlantic Steel Company	102
Atlas Valve Co.	*

B

Babbitt Steam Specialty Co.	130
Babcock & Wilcox (Boilers)	*
Babcock & Wilcox (Refractories)	*
Bailey Meter Co.	32
Baldwin-Hill Co.	*
Bay State Abrasive Products Co.	*
Beico Industrial Equip. Div.	*
Belmont Packing & Rubber Co.	119
Biddle Co., James G.	*
Bird-Archer Co.	*
Blaw-Knox Co., Power Piping Division	101
Boiler Tube Co. of America	110
Borden Metal Products Co.	*
Buell Engineering Co., Inc.	97
Buffalo Forge Co.	*
Bunting Brass & Bronze Co.	*
Bussman Mfg. Co.	*
Byron Jackson Co.	*

C

Carolina Refractories Co.	130
Chapman Valve Mfg. Co.	52
Chicago Bridge & Iron Co.	85
Clarage Fan Co.	30
Classified Ads.	126
Cleaver Brooks Co.	*
Cochrane Corporation	29
Cole Mfg. Co., R. D.	127
Combustion Engr. Superheater, Inc.	31
Columbia Steel Co.	105
Combustion Equipment, Div. Todd Shipyards Corp.	124
Continental Gin Co.	54
Cooper-Bessemer Corp.	27
Copius Engineering Corp.	34
Crane Company	34

D

Dart Mfg. Co., E. M.	113
Davis Regulator Co.	*
Detroit Stoker Co.	24 & 25
Dow Corning Corp.	8
Dowell, Inc.	Back Cover
Dravo Corp.	122

E

Eagle-Picher Co.	*
Edward Valves, Inc.	*
Elliott Co.	*
Emerson Elec. Mfg. Co.	*
Engineer Co.	*
Erie City Iron Works	91
Everlasting Valve Co.	121

F

Fairbanks, Morse & Co.	*
Finnigan, J. J., Co., Inc.	*
Fisher Governor Co.	*
Flexible Tubing Lamin.	*
Flexible Tubing Corp.	*
Fly Ash Arrestor Corp.	*
Foster Wheeler Corp.	*
Frick Company	99
Fyr-Feeder Engineers	129

G

Garlock Packing Co.	28
General Coal Co.	*
General Electric Co.	40
Graver Water Conditioning Co.	44
Grinnell Co.	47
Gulf Oil Corp.	19

H

Hagan Corp.	*
Hajoca Corp.	130
Homestead Valve Mfg. Co.	48
Hotel Pittsburgh	*

I

Industrial Electronics Corp.	130
Inflico Incorporated	*
Ingalls Iron Works Co.	*
Ingersoll-Rand Co.	*
Iron Fireman Mfg. Co.	20 & 21

J

Jefferson Union Co.	122
Jeffrey Mfg. Co.	41
Jenkins Bros.	Inside Back Cover
Jerguson Gage & Valve Co.	104
Johns-Manville, Inc.	*

K

Kennedy Valve Mfg. Co.	125
Kerrigan Iron Works, Inc.	130
Kewanee Boiler Corp.	*
Kirk & Blum Mfg. Co.	*

L

Leslie Co.	*
Liberty Engineering & Mfg. Co.	37
Link-Belt Co.	*
LUBRIPLATE DIVISION Fiske Bros. Refining Co.	*

M

Manning, Maxwell & Moore, Inc.	36
Manzel, Inc.	22
Mason-Neilan Regulator Co.	108
Mercoid Corp.	129

N

National Atroll Burner Co.	120
National Aluminate Corp.	1
National Tube Co.	105
National Valve & Mfg. Co.	109
Niagara Blower Co.	100
Nicholson & Co., W. H.	118
Northern Equipment Division, Continental Foundry & Machine Co.	*

O

Oakite Products, Inc.	120
Okonite Co.	22
Orr & Sembower, Inc.	39

P

Pacific Pumps, Inc.	83
Peerless Pump Division Food Machinery & Chemical Corp.	102
Permutit Co.	*
Pittsburgh-Corning Corp.	123
Pittsburgh Piping & Equipment Co.	*
Plymouth Cordage Co.	*
Powell Co., Wm.	95
Powers Regulator Co.	107

Pratt-Daniel Corp.	*
Preferred Utilities Mfg. Corp.	89
Pritchard Co., J. F.	116
%Proportioners, Inc.	*

R

Raybestos-Manhattan, Inc., Packing Division	50
Reliance Gauge Column Co.	106
Republix Flow Meter Co.	38
Republic Rubber Division (Lee Rubber & Tire Corp.)	*
Riley Stoker Corp.	10 & 11
Robbins & Myers, Inc.	*

S

Sarco Co., Inc.	127
Sinclair Refining Co.	49
Smith Corp., Winfield H.	*
Smooth-on Mfg. Co.	129
Southern Railway System	127
Sprague Electric Co.	13
Springfield Boiler Co.	114
Squires Co., C. E.	*
Standard Oil Co., Inc.	*
Sterling Electric Motors, Inc.	*
Sturtevant, B. F., Div., Westinghouse Electric	*
Subox, Inc.	*
Superior Combustion Industries, Inc.	*
Swartwout Co., The	*

T

Taylor Forge & Pipe Works	23
Terry Steam Turbine Co., The	12
Texas Co.	*
Thermix Corp.	*
Todd Shipyards Corp., Div., Combustion Equipment	124
Tri-Lok Co.	122

U

U. S. Hoffman Mch. Corp.	*
U. S. Treasury	46
United States Steel Co.	105

V

Vulcan Soot Blower Div., Continental Foundry & Machine Co.	22
--	----

W

Wagner Electric Co.	*
Waldron Corp., John	117
Walworth Co.	93
Want Ads	126
Warren Steam Pump Co., Inc.	*
Western Precipitation Corp.	26
Westinghouse Electric Corp. (Apparatus Div.)	*
Wheeler Mfg. Co., C. H.	*
Wickes Boiler Co.	7
Wiegand Co., Edwin L.	124
Wiggins Co., John B.	*
Wing Mfg. Co., L. J.	*
Worthington Pump & Machinery Corp.	*

Y

Yarnall-Waring Co.	14, 15 & 87
--------------------	-------------

Z

Zink Co., John	*
----------------	---

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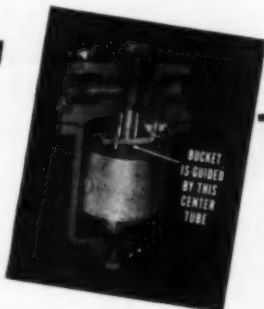
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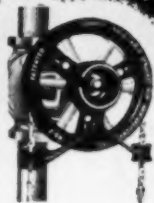
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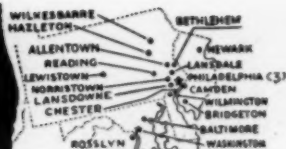
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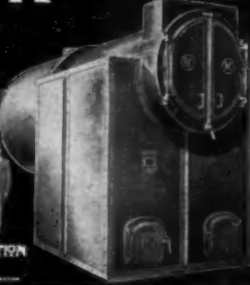
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